

On the Fly with Thermal Management Materials



Faced with rising demand and costs, the aviation industry is experiencing significant change. In times of revolution, Marco Pagni, Aerospace Product and Market Manager at the Thermal Ceramics business of Morgan Advanced Materials, explains what must be considered with thermal management and fire protection blankets, and why compromise is not an option.

With a rise in disposable income among the world's developing and developed economies, demand for flights has increased correspondingly. The aerospace industry is responding. Fleets are becoming larger, fewer aircrafts are being retired and a new wave of low-cost carriers has entered the market. However steadily and surely, fuel prices have continued to rise.

To offset these increases, operators and manufacturers are seeking cost-efficiencies they can pass on to their customers. The development of lightweight and fuel efficient aero-engines is just one way. Shaving costs in maintenance, repair and overhaul (MRO) is another.

This latter represents a significant investment. According to Visiongain, the commercial aerospace industry will spend an estimated \$75.5 bn USD on MRO in 2018 alone. Every product and aspect of MRO is subject to cost scrutiny, including high temperature insulation blankets, though this is one area that cannot be compromised.

Here, it is vital that products are considered for their long-term capabilities and performance as well as their price point. Used to absorb heat and protect engines, aircraft and passengers, these high temperature insulating blankets are vital components of aviation safety.

They're also typically single use items, only ever replaced in the event of fire or product failure. Again, the costs involved are significant. In 2018, one major airline spent circa \$500,000 USD on insulating its fleet, and so there's clearly a temptation to look for cost-savings.

Insulating blankets and materials - not a question of why, but 'which'

Aerospace engines operate at very high temperatures, with exhaust gas temperatures frequently reaching up to 800°C (1,472°F), especially when the thrust reverser is activated. As well as absorbing heat and containing engine fire, the aircraft's wings also need protection. So too do vital components, including the flight data recorder.

With so much at stake, specifications are rigorous. Ultimately though, this is about protecting passengers, so the industry has turned to proven and trusted solutions.

For decades, one product has dominated the market: Min-K® microporous insulation from the Thermal Ceramics business of Morgan Advanced Materials. Combining the high temperature resistance of textile fabrics with the low thermal conductivity of microporous

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insulation, Min-K® was a revolutionary product when it was introduced, and it remains the market leader. Since its launch, the world's aerospace engineers – commercial and military – have worked with Morgan to customise it to their own applications.

With approvals from many of the leading manufacturers, including Boeing, it is a mainstay of the aerospace market. However, while insulating materials such as Min-K® microporous are non-negotiable, the industry is facing increasing challenges with costs. So, with cost pressures mounting, what do engineers look for when evaluating the benefits, and the materials' value proposition?

Thermal efficiency

This is undoubtedly the number one criterion, with high temperature resistance and low thermal conductivity being key measures.

Min-K® microporous insulation is tested according to ASTM C177 test method. Widely accepted as the definitive standard for aerospace, ASTM C177 provides measuring accuracies within 3-5% using the thermal conductivity test method. Min-K® microporous insulation has proven that it has one of the lowest thermal conductivity rates on the market.

Versatility

Whether it's 'boxing' in the flight recorder or wrapping around engine modules, thermal management materials and fire blankets are used for many different shapes and applications. Available in a range of formats, Min-K® microporous insulation is extremely versatile in this respect.

In its rigid form, it can be custom moulded and machined into specific geometries. As a flexible panel or sheet that come in 1m by 1m sheets, it can be shaped to accommodate challenging applications and awkward spaces – but always with the same levels of thermal performance.

Vibration

Clearly, vibration of components and machinery is an ever-present issue in aerospace, potentially causing the insulation blanket to shift and relocate, or even tear. The consequences are reduced insulation at best, or at worse, sometimes a complete void. As an extremely lightweight material with high compressive strength, Min-K® microporous insulation has excellent resistance to vibration.

Quality

In aerospace applications there can be no compromise in terms of quality. Manufactured and controlled under the AS9100 Rev D Quality Management System (QMS) – the gold standard for the aerospace industry – Min-K® microporous insulation sets the benchmark for excellence, delivering exceptional thermal performance and absolute peace of mind.

A huge benefit of implementing this system is that actions to address risks and opportunities are continually identified throughout development. This ensures that any threats of product safety are mitigated.

Faster Installation and Reduced Wastage

Unravelling of thermal blankets is not only an issue when in use, it is also a hugely problematic for installers. If the stitching starts to unravel, the material starts to lose its shape and integrity. Ultimately, once this happens, it is unlikely that it can be used and will need to be scrapped.

With the unique lock stitching used in Min-K microporous insulation, wastage is reduced, while installation is quicker, saving costs on two separate fronts.

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Approvals

Business process

As a versatile material, Min-K® microporous insulation can be used for a wide range of applications, eliminating the need for specifying multiple materials and simplifying business processes. Morgan Advanced Materials also offers a bespoke engineering facility, reducing costs and manufacturing lead time.

Support

All products benefit from reliable support. As an established materials specialist, Morgan offers global access to its R&D, applications engineering and customer service teams, which combine to deliver technical and product support at all stages. Additionally, the specialist product portfolio offers customers a broad range of solutions to a wide range of materials and thermal challenges.

Sailing Too Close to the Wind

As pressures mount on operators and OEMs, the search is on for ever more cost-effective products and solutions. Balanced against this, there are pressing questions of quality and safety.

In terms of thermal and fire protection, these are non-negotiable factors. Quite simply, bargaining on mission critical applications means taking unnecessary risks.

Developed by a world-leading materials specialist and proven over decades and in countless applications, Min-K® microporous insulation remains the material of choice for the aerospace industry. While delivering capital cost savings may well be needed, we must look at the whole picture when it comes to these components. It is necessary to account for what long-term cost savings we can achieve in terms ease of installation and durability.

Most importantly, it offers class-leading performance in the discipline it's designed for; protecting your assets and passengers.