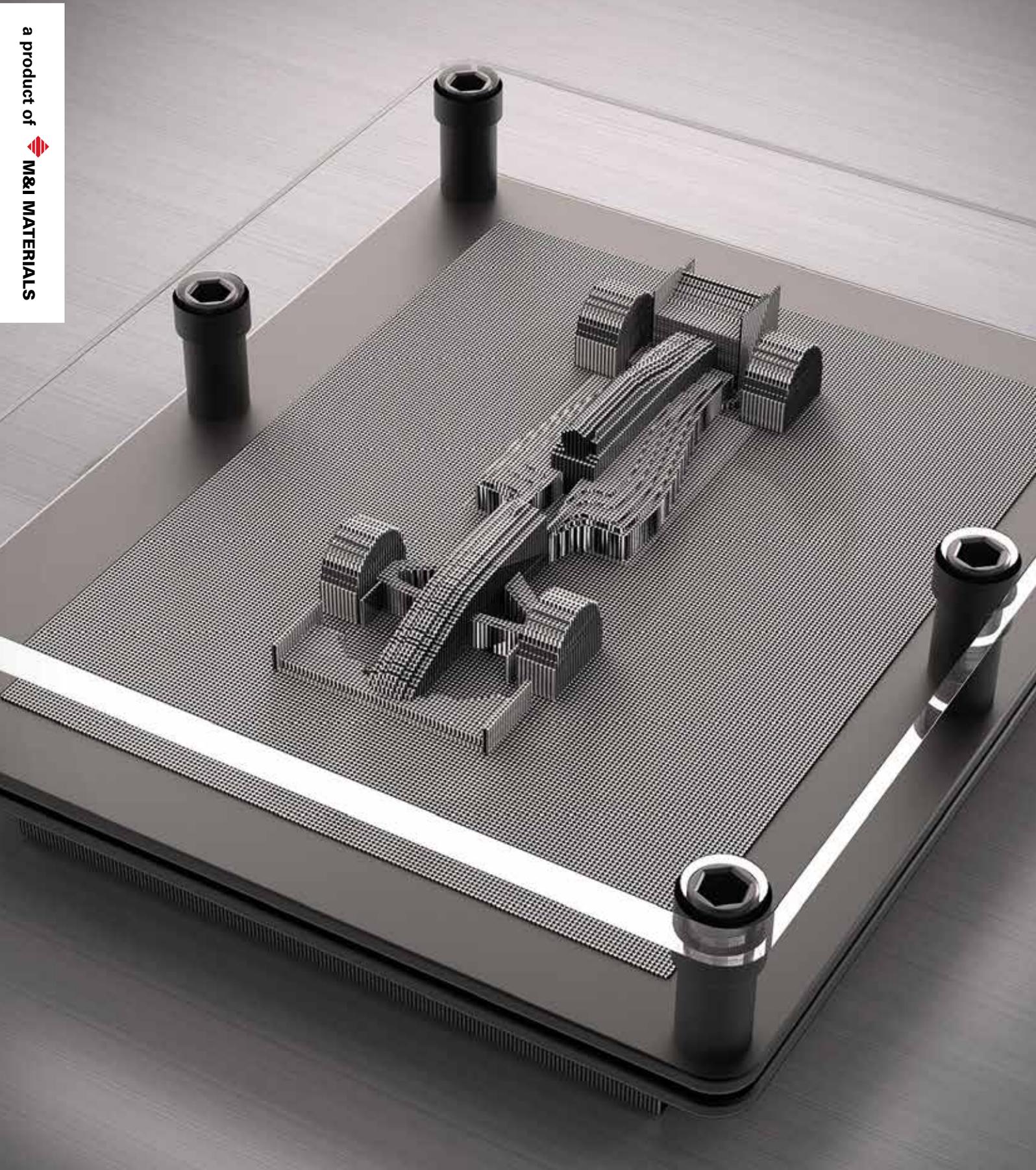


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IN THE KNOW

APPLYING THE TUNGSTEN HEAVY
ALLOY KNOWLEDGE AND EXPERTISE
IN HIGH PERFORMANCE MOTORSPORT
TO OTHER INDUSTRIES

WOLFMET[®]
EXCELLENCE IN TUNGSTEN



THE DEMANDING DYNAMICS OF HIGH PERFORMANCE MOTORSPORT

High performance motorsport represents a demanding arena for automotive engineering in terms of innovation, development, performance and safety. As such, teams require dependable, experienced suppliers that can deliver first-class solutions and meet exacting industry standards. Here, we explore these demands within high performance motorsport, focusing on the important role of specialist suppliers. We also examine how a durable, high-precision material such as tungsten heavy alloy meets the specification and performance requirements of this relentlessly challenging sport. The engineering requirements of top flight motorsport put teams under constant pressure to deliver high-performance race cars that meet strict regulations throughout the racing season. These demands, alongside the need to innovate and stay ahead of the competition, have led teams to look for high-quality materials and flexible, reliable suppliers to help deliver design solutions and facilitate an agile approach in aggressively condensed timeframes.

USING TUNGSTEN HEAVY ALLOY IN HIGH PERFORMANCE MOTORSPORT

Tungsten heavy alloy is a specialised metal matrix composite that overcomes some of the sport's challenges, thanks to its high density. It is mainly used to help achieve optimum weight balance across the race cars, as its high density enables small, high mass components to be placed within exact locations. Consequently, teams can improve weight distribution and maximise performance. Being able to place the weights in this way also helps racing teams fine tune various aspects of

the cars, to optimise race set-up and high-speed stability.

This flexibility is particularly important when adapting to the fast-paced requirements of different race tracks. For example, a tightly constructed street track like the Circuit du Monaco has 19 turns in just over two miles, and the Yas Marina circuit in Abu Dhabi – a modern, purpose built track – has 21 turns in nearly three and a half miles. These requirements can have an impact on the set-up for the races; engineers are tasked with optimising the car's handling performance, which can be aided by the selective positioning of customised balance weights.

Tungsten heavy alloy is also used as ballast to help meet the minimum weight requirements within motorsport. For example, for certain motorsports the Federation Internationale de l'Automobile (FIA) dictates the minimum weight of the car. By using high mass ballast manufactured from tungsten heavy alloy, teams are able to ensure the weight of a car complies with regulations at all times.

In addition to ballast applications, crankshaft counterweights can be manufactured from tungsten heavy alloy to dampen engine vibrations and reduce the negative impact these can have on a race car's

performance. The crankshaft rotational speed changes rapidly during acceleration and braking, putting pressure on components. With a density of more than double that of steel, tungsten heavy alloy counterweights are more compact, while having the strength and durability to ensure they can meet the high-performance requirements of the application.

ADDRESSING COMPLEX APPLICATION CHALLENGES

The volume and complexity of modifications, in conjunction with compressed lead times during the race season, mean that teams require dynamic manufacturing partners that can guarantee a rapid turnaround and produce high precision components to tight tolerances. Meeting these conditions is essential in an industry that demands the best and is represented by globally recognised brands such as Mercedes, Pirelli, BP and Castrol.

With more than 40 years' experience supplying the automotive industry and over 15 years working specifically with high performance motorsport teams, Wolfmet has a rich heritage in the competitive automotive sector. Through a full-service production process, the Wolfmet team are experts at manufacturing a range of complex tungsten heavy alloy designs for motorsport applications.

Complex application challenges can arise both before and during the season, and teams need access to an operationally efficient manufacturing partner to continually innovate and remain ahead of the competition. The Wolfmet team is highly experienced in producing tungsten heavy alloy components within short periods of time, with average timeframes from enquiry to completion measured in days.



As well as handling large volume runs, Wolfmet operations are agile enough to accommodate one-off projects that also arise during the busy motorsport season. This flexibility and proven track record of providing reliable solutions under pressure acts as a support function to teams, which are then able to work towards urgent deadlines, confident in the Wolfmet team's ability to deliver on time.

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In addition to the performance benefits it provides to the world of high performance motorsport, Wolfmet tungsten heavy alloy can be used to meet exacting standards in other application areas. However, the supplier chosen to manufacture components is just as important as the quality of material used. As a manufacturing partner with the expertise, high standards and commitment to continual investment in new technology, choosing Wolfmet enables customers to meet changing demands in their industry.

TAKING TUNGSTEN HEAVY ALLOY KNOWLEDGE AND EXPERTISE BEYOND HIGH PERFORMANCE MOTORSPORT

AEROSPACE AND DEFENCE

The Wolfmet tungsten heavy alloy production unit of M&I Materials is accredited to aerospace standard AS9100, the single quality management standard for the aerospace industry. Being accredited to this standard not only mitigates application risks, it demonstrates excellent levels of traceability throughout the supply chain and reassures aerospace manufacturers of the dependability of their supplier when producing quality products and prototypes.¹ Wolfmet engineers use reliable,

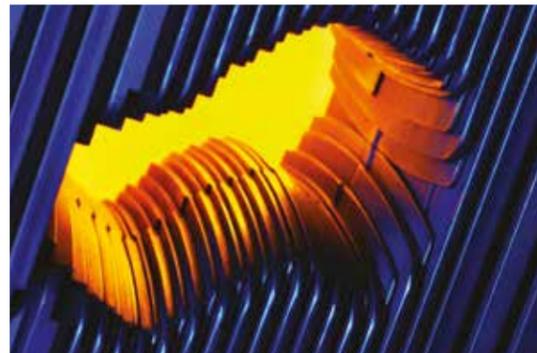
efficient processes to produce components and help bring products to market more quickly. In addition, having the flexibility to maintain high standards even when timeframes are tight enables the Wolfmet team to meet different customers' needs and support innovation.

NUCLEAR

The high density and superior radiation attenuation properties of Wolfmet tungsten heavy alloy, coupled with its ability to meet stringent quality standards, means Wolfmet is ideally suited to help overcome complex application

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challenges in the nuclear industry. For example, Wolfmet tungsten heavy alloy components are used to provide bespoke radiation shielding within nuclear medicine, which involves the use of radiation in the diagnosis and treatment of disease. Protecting patients and medical staff is critical in such a sensitive environment, and customers operating in this sector demand complete assurance regarding the reliability of the material provided by their supplier. For instance, in therapeutic applications, complex equipment such as multi-leaf collimators can be created using tungsten heavy alloy, enabling direct beams of radiation to destroy the tumour, while minimising any damage to the patient's healthy cells. In addition, the Wolfmet team is experienced in providing high-quality, bespoke shielding for applications

such as transportation containers for medical isotopes, where materials of increasingly high energy levels are being transported over long distances.

POWER GENERATION/MARINE

Wolfmet tungsten heavy alloy can be used to control and dampen heavy vibrations within large-scale diesel power generators, such as those used in marine applications. This prevents issues including wear of internal components, damage to the engine structure, and failure of the crankshaft.² Using Wolfmet tungsten heavy alloy crankshaft counterweights can help to lessen the physical impact of extreme force by balancing the weights of the engine's connecting rods.

MANUFACTURING

Manufacturing and fabricating companies regularly require solutions to help lessen the impact of high levels of force and maintain high quality standards for customers. For example, in Computer Numerical Control (CNC) machining, Wolfmet tungsten heavy alloy boring bars can be used to provide high density and a high modulus of elasticity, to ensure stability of the shaft and operational accuracy. Compared to standard steel tool holders, Wolfmet tungsten heavy alloy provides superior damping qualities, helping manage dynamic vibration in the tool shank and deliver an improved finish on the work piece.

¹ AS/EN 9100 Series: Aviation, Space and Defence

² Marine Insight, Understanding Vibrations in Marine Engines, July 2016

SUMMARY

High performance motorsports demand the highest standards of engineering innovation, safety and performance. Design engineers need a flexible, reliable partner that can supply quality components and demonstrate a critical ability to adapt to their changing requirements.

Through its heritage and capability in competitive motorsport and an agile process from manufacturing to delivery, the Wolfmet team has the knowledge and flexibility to meet the demand of changing customer requirements.

A motor car needs to perform at its maximum level, before and during a season. Wolfmet tungsten heavy alloy components and service help race teams keep the cars operating at a high level.

Applications for Wolfmet tungsten heavy alloy are not limited to motorsport. Uses for the highly dense material extend to other applications where deploying high mass in small spaces and reducing vibration is essential to maximising performance, safety and stability. It also provides crucial advantages in nuclear shielding, providing protection against harmful radiation, and to markets undergoing technological advancement requiring high levels of precision. Common to all areas where Wolfmet is used are two constants: a demand for technical excellence and a need for quality products. Wolfmet exceeds these expectations every day and the team constantly looks for ways to enhance future performance.



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