

Advanced Thinking in Advanced Materials



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NEWS RELEASE

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April to June 2016

# Morgan Solution Has a Bearing on Success Within Automotive Sector

APRIL 2016

Morgan Advanced Materials, a global specialist in the development and manufacture of seals and bearings for demanding environments, has delivered a new type of bearing for electric water pump applications in cars which reduces component count, while optimising performance and engine efficiency.

Within the automotive sector, there has been a notable shift from traditional, belt-driven coolant pumps to electrical equivalents, on the basis that these reduce demand on the belt drive, offering a substantial improvement in performance and greater overall efficiency with 'on-demand' cooling. The design of these pumps typically feature an impeller shaft which is supported by two bearings. Morgan was approached by a customer with the challenge to provide a less cumbersome bearing solution without compromising overall pump performance and cooling capability.

Drawing on its world-leading expertise in materials science and molding technology, Morgan successfully produced a bearing solution comprised of its P5600H proprietary carbon graphite material with a length-to-diameter ratio of two, which also included numerous face details and inner diameter (ID) and outer diameter (OD) slots. Morgan's solution was more cost-effective and offered a substantially greater ease of assembly, as well as containing the vital component features

which aid lubrication and prevent slip and anti-rotation.

While engineered plastics can also be used in this kind of application, they are typically not as strong and are more susceptible to wear and creep. Materials like Morgan's proprietary carbon are, however, significantly better suited to the demands placed on them. Typically they have longer lifespans due to their impressive tribology, stability at high temperatures and resistance to wear and tear. This is of high importance for bearing components as in the event that one sub-component becomes faulty, the entire unit must be replaced, resulting in additional cost and the disruption associated with increased warranty claims.

Michael Ritter of Morgan Advanced Materials, explained: "Morgan's proprietary method for producing bearings of this geometry has enabled us to deliver a range of performance advantages otherwise unattainable with conventional molding technologies. Using our unrivalled expertise in the fields of materials science and application engineering, we were able to develop a process that allowed us to provide a superior solution in terms of performance and cost. Our constant focus on innovation and problem-solving is what drives us forward as a business, allowing us to solve our customers' most pressing engineering problems."

# Morgan Develops 2mhz Transducer to Ensure Better Accuracy in Changing Temperatures

APRIL 2016

Morgan Advanced Materials, a world leader in the field of sensor and measurement technology, has launched a 2MHz ultrasonic transducer which gives minimal and predictable changes in zero flow offset due to varying temperature cycles, ensuring optimal measurement accuracy over time.

In the context of industrial and domestic water applications, it is vital to ensure that meter readings accurately reflect the quantity of water used. While Morgan recently developed a method to measure the zero flow offset for a broad range of transducers, the challenge it faced was to account for changes in water temperature which can have an impact on zero flow offset. Previously, this was difficult to achieve, leading to unpredictable results and difficulties in calibration, with the net effect being reduced accuracy.

Morgan has now successfully developed a transducer with stable zero flow offset changes according to temperature cycles, resulting in greater overall accuracy. Operating within a range of 2°C (36°F) and 65 °C (149°F), zero flow offset is up to 40 picoseconds (ps) at low temperatures, while at

higher temperatures it is up to 60ps. With this knowledge, transducers can be calibrated in line with these trends.

Morgan's proprietary range of transducers is comprised of materials which remain stable at different temperatures, ensuring that results are not comprised by external conditions which may undermine the quality of the measurement. Using a 2MHz sound wave can help maintain accuracy by keeping a high signal to noise ratio, as the possibility for sound waves to be reflected around the pipe is reduced.

Oksana Jaroszak, Development Engineer at Morgan, commented: "We have applied our unrivalled expertise to deliver greater measurement accuracy in transducers used in water supply, both domestic and industrial. Ensuring more precise measurements enables our customers to ensure the way they calculate payments for users accurately reflects water usage, minimising, where possible, the risk of inaccurate charging."

# Morgan Extends Bomb Disposal Suit Range With Cutting Edge Silverback 3020 Elite Search Suit

APRIL 2016

The Composites and Defence Systems business of Morgan Advanced Materials has further extended its acclaimed range of life-saving bomb disposal suits with the launch of its new, high performance Silverback 3020 Elite search suit.

The Silverback 3020 Elite incorporates a wealth of materials technology, cutting-edge developments and world-leading garment engineering. The suit has been designed for extended wear, offering high protection while maintaining outstanding flexibility, making it ideal for use in search and bomb disposal missions in a high-threat environment. It provides high levels of protection from blast, low-speed impact, fragment penetration and flame immersion, and features an integrated spine protector to mitigate the effects of blunt trauma.

Improved operational flexibility is delivered through the integration of armour pouches and ancillary attachments, enabling greater integration with multidisciplinary teams. Scalable armour, through the utilisation of Morgan's ultra-lightweight LWB III+ or LWA IV+ plates, can be attached to the front and back of the Silverback 3020 Elite, allowing the user to work in breaching and protection roles in addition to search and render-safe tasks. The Silverback 3020 Elite suit comprises a lightweight jacket and trousers which, along with the suit's integrated cooling system and lightweight helmet, are designed to maximise flexibility, manoeuvrability and comfort. Wearers can climb, crawl and crouch with ease, without compromising protection levels.

Duncan Eldridge, President of Morgan's Composites and Defence Systems business, said: "The development of the Silverback 3020 Elite search suit represents a step change in bomb disposal suit technology; the addition of scalable, interchangeable armour systems offers significant benefit to the user as the suit can now be adapted to the threat level. We are delighted to support EOD (Explosive Ordnance Disposal) search teams across the world through the development of class-leading, high-protection, highly flexible bomb disposal suits."

The Silverback 3020 Elite is the latest in a range of high-performance defence systems from Morgan, offering outstanding protection at the lowest weight. The range includes the Lightweight Armoured Soldier Architecture (LASA) personal protection portfolio, Silverback bomb disposal suits, CAMAC® platform armour and armoured vehicle systems.



# Morgan Develops Gas Flow Measurement Capability for Extreme Environments

APRIL 2016

Morgan Advanced Materials, an industry-leading specialist in the design and manufacture of sensing technology solutions, now has the capability to develop gas flow transducers which remain accurate in harsh environments subject to extreme temperatures and the presence of highly corrosive chemicals.

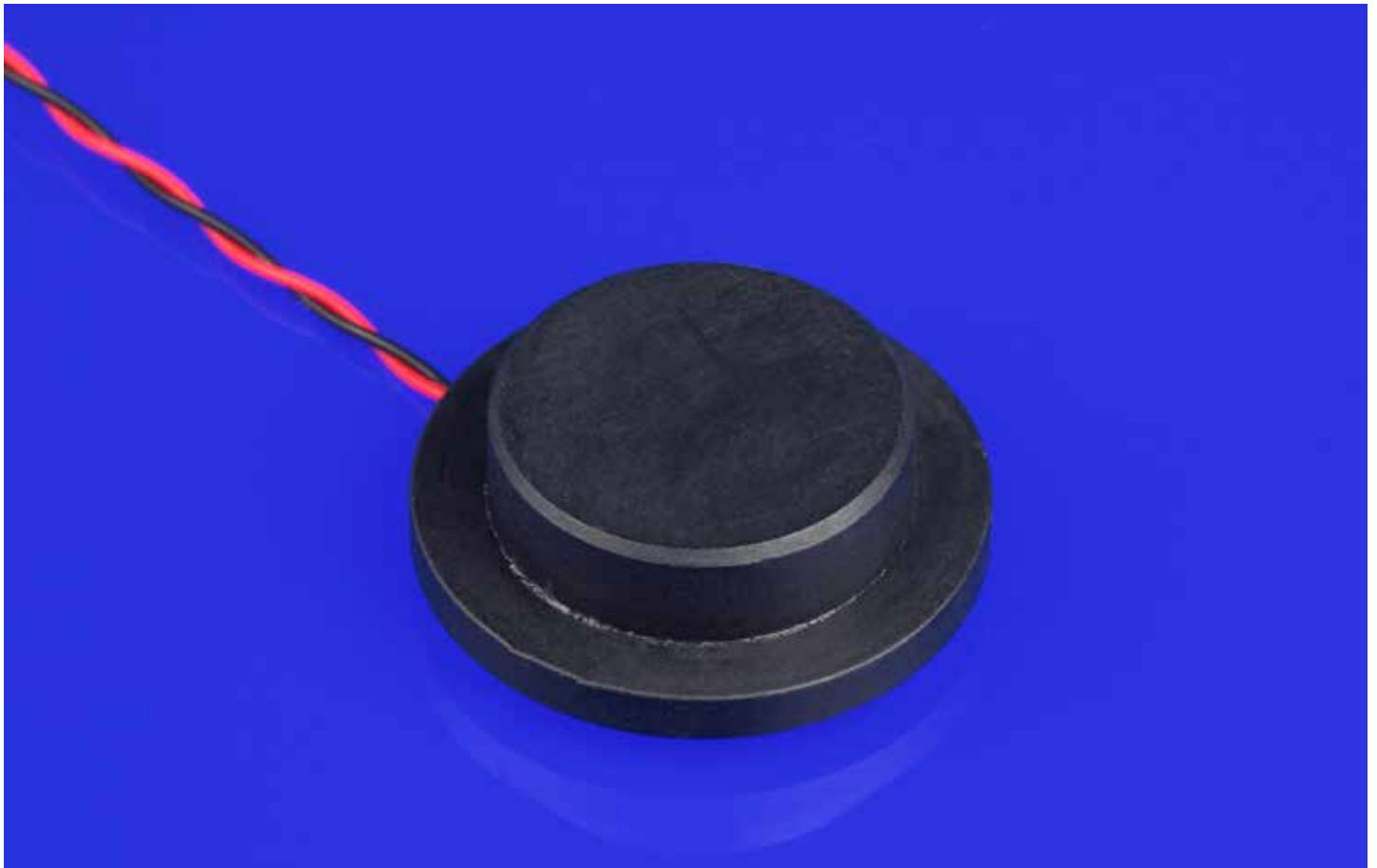
Drawing on its extensive knowledge and experience in gas transducer technology used within a range of applications, Morgan has surpassed industry standards by producing sensors which are operational within an even greater range of temperature extremes than ever before. For instance, its latest gas flow transducers can now work within a temperature range of  $-50^{\circ}\text{C}$  to  $250^{\circ}\text{C}$  ( $-58^{\circ}\text{F}$  and  $482^{\circ}\text{F}$ ). This greater tolerance to extreme temperatures and harsh environments, i.e. those which are likely to experience variances in gas flow, makes Morgan transducers ideal for use within oil and gas exploration as well as bulk gas meters for industrial applications. In addition, Morgan's capability within very low temperature sensing means that it has been able to test and measure the flow of cryogenic fluids down to  $-175^{\circ}\text{C}$  ( $-283^{\circ}\text{F}$ ).

These developments will enable Morgan to respond to a growing market demand for compact sensors which remain extremely accurate, to within 0.1%, irrespective of harsh

environmental conditions. Morgan's selection of materials are both extremely thermally stable and corrosion resistant, enabling transducers to operate under high temperature as well as in the presence of aggressive gaseous acids. Perhaps more significant, however, is Morgan's groundbreaking work in minimising zero flow offset, which ensures a superb level of calibrating transducers accordingly in response to fluctuations in temperature. Within the next few months, this capability will enable Morgan to deliver standard solutions for the wider industrial market or, indeed, for any other application where there is a requirement to accurately measure large quantities of high temperature fluids or gas.

Charles Dowling at Morgan Advanced Materials, commented: "This enhanced capability will enable us to better serve our customer base by ensuring we can provide solutions to meet all requirements."

In addition to a standard range of gas transducers that are currently in the pipeline, the possibility of designing custom solutions for niche applications, in a range of materials, is now very much a reality. By continuing to push the boundaries, we aim to support our customers in overcoming their most pressing engineering challenges."



# Achieving Growth in Agricultural and Industrial Applications: Morgan and Gripple

APRIL 2016

The ongoing relationship between Morgan Advanced Materials and Gripple is proving highly successful in agricultural and industrial applications around the world. By including Morgan's renowned Sintox™ FA alumina ceramic in their range of steel wire joiners and tensioners designed for use in agriculture and construction, Gripple has distinguished itself from more mainstream competitors. So it is little wonder that this employee-owned business is going from strength to strength, and that Morgan has helped Gripple to deliver more than 20 million units per year to 86 countries.

The founder of Gripple Hugh Facey, came up with the idea on a wet Welsh hillside in the mid-1980s and the innovative Gripple fastener first went on sale in 1988. The original product provided an alternative to the knotting and bending techniques that had, until then, been used to construct wire fences, and was quickly adopted by customers across the world. The name of the product was derived from its ability to 'grip' and 'pull' the wires it was attached to.

Over time, the product range developed, and today the company is the acknowledged market leader, with a huge range of products. Gripple now manufactures items for civil construction, building and seismic protection applications, as well as for agriculture. Some things, however, have not changed — one of those is Gripple's long-standing relationship with Morgan Advanced Materials, which has lasted for more than 15 years and continues to thrive.

## THE CHALLENGE

Gripple needed to ensure the durability and robustness of the rollers inside their popular Gripple Plus wire joiners and tensioners, but this presented a considerable design and manufacturing challenge. The Gripple Plus is a joiner and tensioner in one, which is often used on fence, trellis and support wires. It allows users to secure fences four times faster than knotting and other traditional methods, and in a manner that maintains the inherent strength of the wire. The Gripple Plus range also permits high load holding.

The rollers are a critical part of each unit, because they grip and hold the wires. During installation, wire is inserted into a channel within the Gripple Plus, where it is gripped by a spring-loaded roller and tensioned as it is pulled through the channel.

As the Gripple Plus is used in agricultural and industrial settings around the world, the rollers within the products must be able to withstand constant exposure to the elements, extremes of temperature and the threat of events such as earthquakes and explosions. They must also be corrosion-resistant. As a result the rollers must be made from a highly robust and extremely stable material that will retain those properties

over their lifetime. Thus for Gripple, the challenge lay in finding a material that could fulfil all of these requirements.

## THE SOLUTION

Fortunately, Morgan was able to provide the ideal solution: Sintox™ FA. This 95% alumina ceramic exhibits excellent strength and stiffness in compression, superior hardness and wear resistance, and has good thermal stability. The fact that the material remains stable at high temperatures, has a low coefficient of thermal expansion and is non-combustible and electrically insulating makes it ideal for Gripple's purposes.

The partnership between the two companies is further strengthened by Morgan's commitment to customer service. Using a web-based inventory management system, Gripple's supply chain team can quickly and easily order new stock, which Morgan delivers within a week. This in turn allows Gripple to offer next-day delivery to its own clients. The combination of Morgan's top quality products and superb customer service allows Gripple to maintain its own commitment to high quality, and its profile as the market leader. Furthermore, Gripple distinguishes itself from much of the competition by using a cutting-edge, high performance ceramic within its agricultural fastening products.

Looking to the future, both Gripple and Morgan anticipate further growth, and intend to continue the pattern of continuous improvement that has been established during their partnership. Once more, Morgan Advanced Materials is at the heart of a system that delivers great performance in a range of very demanding environments and applications.





# Morgan Solution for Electric Vacuum Pump Vanes Delivers Benefits for OEMS

MAY 2016

Morgan Advanced Materials, a global specialist in the development and manufacture of seals and bearings for demanding environments, has brought to market a newly formulated carbon graphite vane material. Designed to reduce the processing time and effort for vanes in electric vacuum pumps within the automotive sector, the vane also improves overall product performance and longevity.

Morgan utilises its high-volume production technology to deliver its state-of-the-art MAT 679 material, delivering cost and time efficiencies to OEMs in the automotive sector.

MAT 679 extends the life of the vane compared with the best alternative materials.

Michael Ritter of Morgan Advanced Materials commented: "MAT 679 is our latest proprietary lubrication enhancing impregnated carbon graphite and has been specifically developed to meet the most stringent requirements of vacuum and dry running applications.

"Working closely with our customers in the automotive industry, this material has been designed for efficiency and mobility, improving product performance with enhanced wear rate predictability while leveraging "local" production facilities to simplify logistics."

During the development process, Morgan installed in-house application test devices to simulate real automotive vacuum pump conditions, benchmarking a variety of materials in a number of market-leading pumps for wear and potential failure.

Michael Ritter continues: "ASTM International standards do not accurately replicate the real conditions experienced with these applications, which means the results may not be a reliable indication of material performance.

"We wanted to engineer a material that delivers unrivalled performance, so we developed our own in-house testing application that is capable of simulating true-to-life conditions. Using these highly reliable test results we have been able to deliver a material which reduces manufacturing processing and enables production in key regions of the world without compromising on performance."

Capable of withstanding the harsh environment of an automotive electric vacuum pump, MAT 679 successfully operates at temperatures in excess of 200°C (292°F). This outstanding material performance, combined with Morgan's regional manufacturing solutions, is the ideal combination for automotive OEMs and engineers looking to deliver quality and longevity, alongside cost and time efficiencies.

# Morgan Launches Ultra-Lightweight Covert Ballistic Insert

MAY 2016

Morgan Advanced Materials, a world leader in the application of advanced composite armour technology, has launched the latest addition to its highly-regarded lightweight armoured soldier architecture (LASA) range of combat equipment – the LASA LWB Covert. The latest innovation from Morgan's Composites & Defence Systems business is an ultra-lightweight, thin, high-performance hard plate insert that is ideal for military and law enforcement operations where the wearer needs to blend in with their surroundings.

Shaped to conform to the user's body shape, with a thickness of just 13mm and edges tapering to 6mm, the plate can be concealed under standard clothing. Once in place, it protects the wearer from threats and special threats that include both 5.56 x 45mm 55gr ball (M193) and 7.62 x 39mm 123gr PS ball (mild steel core) ammunition. Utilising a shooter's cut, the LASA LWB Covert weighs just 686g with an aerial weight of 11.9 kg/m<sup>2</sup>. Furthermore, it is buoyant, and suitable for use in conjunction with approved soft armour.

Duncan Eldridge, President of Morgan Advanced Materials – Composites & Defence Systems, commented: "We are delighted to launch the discreet LASA LWB Covert ballistic insert, which delivers exceptional, multi-hit covert protection at an extraordinarily low weight and thickness. Our expert knowledge in composite armour design has allowed us to add another world leading ballistic insert, meeting the varied needs of modern military and law enforcement personnel to our suite of leading personal armour technology."

The LASA LWB Covert is the latest product in Morgan's LASA portfolio, which is comprised of ultra-lightweight ballistic inserts, ballistic shields and hybrid composite helmets. LASA products are built to maximise safety while minimising weight, a target that is achieved largely through Morgan's use of cutting-edge materials, backed by the company's rigorous in-house testing strategies and dedication to innovation.

# Morgan Demonstrates Non-Contact Ultrasonic Flow Sensor for Unrivalled Accuracy In Medical Applications

MAY 2016

Morgan Advanced Materials, a global specialist in the development and manufacture of ultrasonic sensors and transducers, is developing a new non-contact ultrasonic flow sensor which is typically five times more accurate at low flow rates than other ultrasonic sensors available in the medical and laboratory sectors.

The new range delivers highly reliable accuracies of +/-5% on flow rates as low as 2ml/min in a variety of fluids including blood, saline and buffer solutions with similar performance at higher flow rates of up to 500ml/min, making the sensors ideal for dialysis and blood apheresis applications.

The products feature an ultrasonic transducer at either end of a disposable flow tube to accurately calculate flow rates using the 'time of flight' method. The sensors have been specifically designed to have very low zero flow offset which greatly reduces their systematic error rate, meaning they may only require factory calibration.

The low-cost disposable flow tube has been optimised to minimise turbulent flow, while the sensors do not come into contact with the fluid. This makes them ideal for environments where accurate flow measurement and the sterilisation of equipment are both key drivers. Dialysis is one such application, where the flow of blood can be accurately measured to optimise treatment plans, reduce the time patients spend in hospital and improve their overall quality of life.

Martin Murawiecki, Product Engineer at Morgan Advanced Materials, explains: "There are many medical

and laboratory applications where the flow of liquids needs to be accurately measured, but where the physical presence of a sensor could contaminate the fluid.

"By working in conjunction with influencers within the medical and laboratory sectors, we have been able to leverage our expertise in the field of ultrasonics to create a sensor that is easy to install and operate, requires no sterilisation and is typically five times more accurate at low flow rates than competing ultrasonic products, while still being competitively priced."

The 'time of flight' method of measuring flow rates refers to the use of two ultrasonic transducers which act as both a transmitter and receiver of sound energy. The difference in time it takes the sound energy to travel between the two sensors (through the blood or other liquid) directly and exactly relates to the velocity of the fluid in the disposable flow tube, giving a highly accurate recording of the flow rate. Morgan's flow sensor records the flow rate values up to nine times per second, allowing the sensors to react extremely quickly and accurately to any changes in the flow rate.

Martin Murawiecki adds: "For the medical and laboratory sectors, having an ultrasonic flow sensor which not only dramatically improves the accuracy of flow rate measurements, but also upholds strict contamination procedures by not coming into contact with the fluid, is of enormous benefit. This facilitates more precise treatment of patients while, through the use of disposable and non-contact components, time is reduced during the sterilisation process."



# Morgan Launches Thermal Bag To Counter Fire Risk From Lithium-Ion Batteries

MAY 2016



Morgan Advanced Materials has introduced to the aviation market a novel means of tackling the risk posed by overheating lithium-ion batteries, following an extensive period of testing in conjunction with Germanwings, part of the Lufthansa Group.

The FireMaster battery bag, which measures 500mm x 500mm, comprises two of Morgan's specialist thermal materials to create a sealable, water-resistant compartment capable of containing the heat spread in the event of a primary-lithium or lithium-ion battery fire.

Lithium batteries are used in many every-day electronic devices, such as mobile phones, tablet computers and MP3 players. While they are considered a safe and effective form of power storage for portable technology, there have been a number of alarming instances of overheating, with the potential for 'thermal runaway'. This has raised questions over their safety within an aircraft environment and driven an increase in regulation in this area.

The term 'thermal runaway' is used when a lithium battery overheats past its point of thermal stability (150°C/302°F), resulting in fire, explosion, a pressure wave, or all three.

Thomas Schwarz, Sales Director for Morgan Advanced Materials' Thermal Ceramics business, explains: "The transportation of lithium-based batteries as cargo has been regulated by the aviation authorities for more than a decade, but no limitations have been placed on the transportation of these products within the main aircraft cabin.

"Thermal runaway, although a rare occurrence, can have a catastrophic effect on an aircraft in flight and passenger airlines have been proactive in trying to find a solution to this manageable danger. Now, thanks to the help of Germanwings, we have been able to leverage our expertise in the field of thermal technologies to create a solution to this problem."

At its core, the bag benefits from Morgan's FireMaster Marine Plus technology, which was originally designed for use in the Oil & Gas sector. Providing thermal protection from uncontrolled fire for sustained periods of time, Morgan's FireMaster material is now making its debut in the aviation market in the fight against thermal runaway. The outer layer of the bag comprises a silicone-coated glass cloth and hook-and-loop tape fastener, which secures the bag once the contents have been placed inside.

Maintaining their integrity even when they come into contact with water, which can be applied immediately to help cool the overheated battery, the materials are bound with a high-temperature yarn, typically used in heat protection clothing and welding equipment.

The bag, which is large enough to protect a number of portable devices at once, has been hailed a safe and reliable solution which delivers tried and tested performance at a competitive price.

The US Federal Aviation Administration (FAA) has recorded an average of six incidents every year for the last 25 years involving batteries carried as baggage or cargo, with an increasing proportion of these being caused by lithium batteries. Studies have proven that lithium battery fires cannot be adequately suppressed by halon fire extinguishing methods, leading to both primary lithium and lithium-ion batteries being categorised as Class 9 hazardous materials.

Both the FAA and the International Civil Aviation Organisation (ICAO) have restricted the transportation of lithium-based batteries as cargo, with the most recent ruling taking effect from the 1st April 2016. Now, thanks to Morgan's expertise in materials technology, passenger airlines can further eliminate the threat of thermal runaway caused by such batteries in the main cabin space.



# Morgan's High-Power Ultrasonic Expertise Optimises Performance in Water Processing

JUNE 2016

Morgan Advanced Materials has applied its world-leading ultrasonic transducer technology to water purification, helping to deliver components which improve performance in wastewater applications.

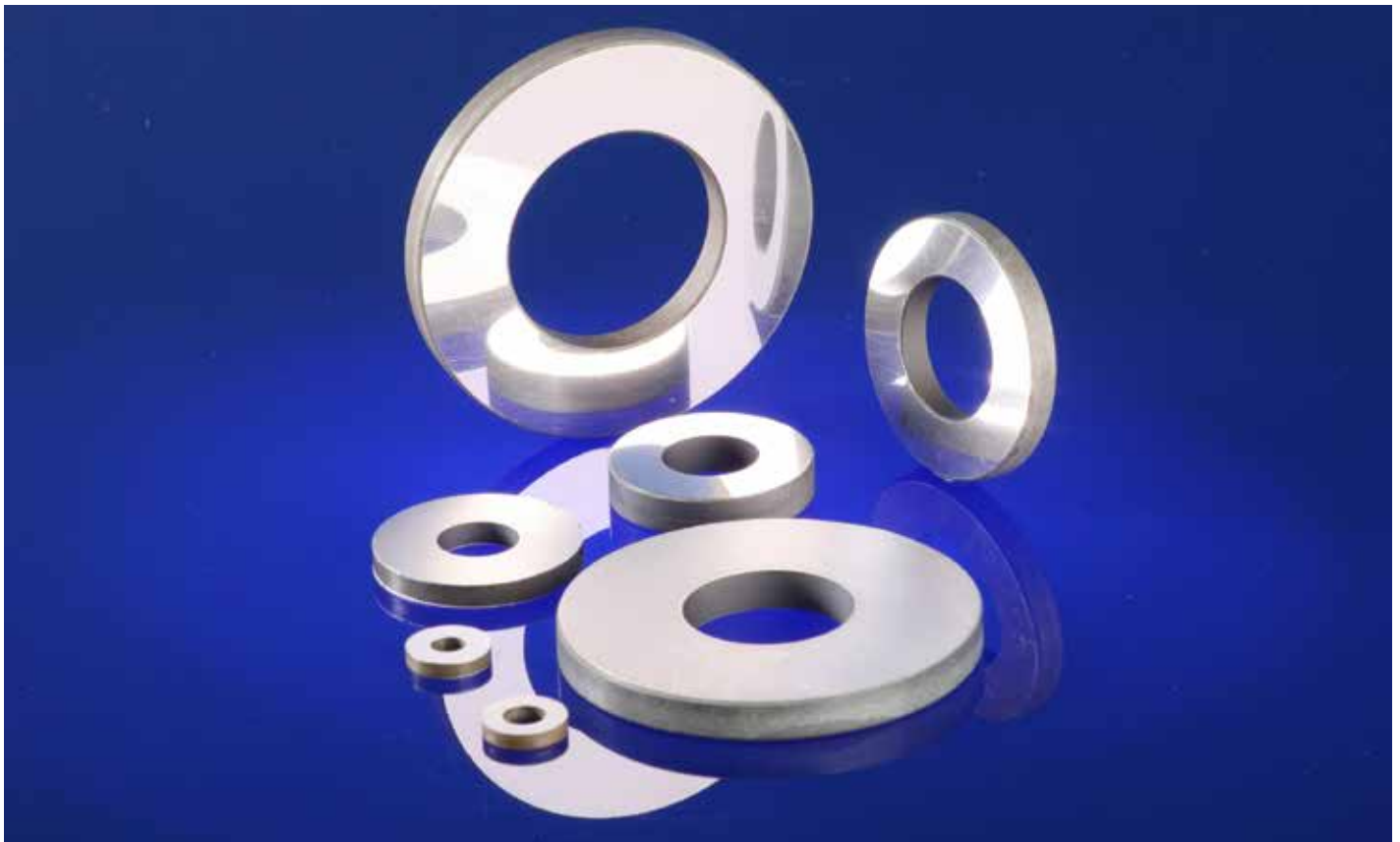
New processes using high-intensity ultrasound waves to break down bacterial biomass found in impurities in water, have become increasingly popular in recent times. Unlike conventional processes currently used, ultrasonic is particularly environmentally-friendly due to the absence of potentially harmful chemical agents, such as methanol. Similarly, it offers superior performance when disinfecting water with high levels of turbidity, while traditional methods such as UV or chlorine are ineffective in such cases.

Central to the purification process are high-power transducers made from Morgan's proprietary range of PZT8 ceramics. Drawing on its industry leading expertise in specially-engineered ceramic materials, Morgan ceramic rings, originally used in welding and other high power applications, have for the first time been incorporated into ultrasonic transducers used in water treatment applications. This latest innovation offers a range of performance advantages including high permittivity, low dielectric losses, high density, high piezoelectric activity and a high mechanical factor. Available in a range of sizes

with a maximum diameter of 65mm (2.6inches), Morgan rings exceed the maximum width of ceramic rings currently on the market, allowing for the application of a greater volume of power, in some instances as high as 3kW.

In aqueous media, ultrasonic waves cause periodic compression and extension of the water molecules, resulting in the formation of microscopic voids in the liquid. Such voids become bubbles of water vapour or gas and expand to the point of implosion. Large cavitation bubbles are typically produced from a range of 20 to 100kHz, depending on the viscosity of sludge and therefore the level of force required, creating high mechanical shear forces capable of destroying even the most robust surfaces. Furthermore, sonication causes a reduction of the viscosity of the fermenter content, reducing the power consumption of the agitators and pumps used in the purification process.

Frédéric Pimparel, Technical Application Manager at Morgan Advanced Materials, explained: "This latest development in wastewater treatment technology would not have been possible without the application of Morgan's world-leading expertise in specialised materials. Our ceramic materials boast a range of properties which make them ideal for use in water treatment applications, optimising the purification process while negating any adverse side effects for the environment."



# Morgan and D3O Create World's Most Advanced Helmet for Defence Sector

JUNE 2016



Morgan Advanced Materials, a world leader in the application of advanced composite material technology, has incorporated D3O TRUST high-performance padding system into its ultra-lightweight combat helmet portfolio, the LASA AC914 and LASA AC915. The combination of Morgan's hybrid composite ballistic helmet shell technology, with D3O's impact pads is believed to be the most advanced combat helmet in the global market.

The D3O TRUST helmet liner system, created by the experts in real-world impact protection solutions, is engineered using patented composite materials. The seven-piece system which exceeds required Advanced Combat Helmet (ACH) protection levels by 33% at 10ft/sec, has now been used by Morgan to complement its world leading ballistic helmet shell technology.

Morgan's LASA AC914 and LASA AC915 ballistic helmets are manufactured using proprietary ultra-lightweight, composite hybrid technology, which provides structure, durability and a level of protection at weights significantly lower than previously available. The helmets are the outcome of over three years of materials and product development at Morgan's Ballistics Centre of Excellence.

Weighing in at 1.25kg (2.9lb) for a full cut LASA AC914 helmet and 1.15kg for a high cut LASA AC915 variant, these composite hybrid helmets are 7.5% lighter than a typical advanced combat helmets with 10% enhanced 17gr FSP Performance (735m/s). Built for comfort and endurance, the D3O TRUST 10ft/sec blunt trauma impact padding

system exceeds all regulatory performance standards and is recognised as the most durable and comfortable solution on the global market.

Duncan Eldridge, President of Morgan Advanced Materials – Composites and Defence Systems, explains: "Morgan has been at the forefront of ballistic protective combat helmet design for more than 30 years and we are proud to partner with D3O in the creation of our most advanced combat helmet yet".

"The unrivalled performance of the D3O TRUST padding system and the resulting helmet is one which provides the highest levels ballistic protection at an extraordinarily low weight – a technological advancement which is sure to shape the sector."

Todd Dunnagan, Director – D3O Global Defence Sector commented: "Morgan's helmet shell technology provides flammability protection, ballistic protection and a structurally sound platform for the integration of blunt impact and retention systems, which, combined with the comfort and shock-absorbing capabilities of our D3O TRUST helmet liner system, delivers the ultimate lightweight, high-performance head protection solution."

Available in a variety of configurations, the LASA helmets are compatible with in-service equipment including night vision goggles, as well as an array of other accessories. The LASA AC914 and LASA AC915 are available to purchase through Morgan's locations in the UK, Canada and Singapore.

# New Ultra-Lightweight Ballistic Shields Offer World Class Multi-Hit Protection

JUNE 2016

Morgan Advanced Materials, a global leader in the field of materials and advanced lightweight ballistic shield systems technologies, has launched a new range of high-specification ballistic shields as part of its Lightweight Armored Soldier Architecture (LASA) range.

Complementing Morgan's existing range of hybrid composite helmets and ballistic inserts, LASA Ballistic Shields deliver outstanding multi-hit protective performance despite weighing 20% less than existing in-service solutions, at a thickness of just 16mm (0.6inch).

Utilizing Morgan's world-leading ballistics expertise and pioneering research and development into composite materials, the LASA ballistic shields offer protection to NIJ 0101.06 Level III and the following special threats: 7.62 x 51mm 149gr M80 FMJ; 5.56 x 45mm 55gr Ball (M193); and 7.62 x 39mm 123gr PS Ball (Mild Steel Core).

Available in four standard sizes to suit a broad spectrum of operational requirements in both military and law enforcement situations, designs can also be customized to meet specific customer needs, as required.

Smaller variants in the range have been specially designed to offer full mobility to end users, enabling the user to move at speed while remaining protected. The larger variants are available for environments where a more comprehensive level of protection is required.

Duncan Eldridge, President of Morgan Advanced Materials - Composites & Defense Systems, commented: "Our goal with the LASA range is to provide a range of solutions which offer proven, premium protection at the lowest possible weight, for both military and law enforcement applications.

Lower weight means greater mobility and reduced fatigue – a key benefit for those operating on the front line. Our world-leading expertise in composite research and development for ballistics, coupled with extensive testing, enables us to meet the varied needs of elite military and law enforcement personnel around the world."



## ABOUT MORGAN ADVANCED MATERIALS



Morgan Advanced Materials is a global engineering company offering world-leading competencies in materials science, specialist manufacturing and applications engineering.

We focus our resources on the delivery of products that help our customers to solve technically challenging Problems, enabling them to address global trends such as energy demand, advances in healthcare and environmental sustainability.

### What differentiates us?

Advanced material science and processing capabilities. Extensive applications engineering experience. A strong history of innovation and reinvention. Consistent and reliable performance. A truly global footprint. We find and invest in the best people.

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