Morgan Advanced Materials

15.2

Advanced Thinking in Advanced Materials

NEWS RELEASE

Press Releases from April to June 2015

Morgan advanced materials war memorial rededication

Aprill 2015

A war memorial commemorating the loss during World War II of six servicemen who were employed at the facility now owned by Morgan Advanced Materials in Stourport-on-Severn, Worcestershire, has been officially rededicated.

The service was attended by senior directors from Morgan, current and past employees from the Stourport facility, relatives of the six men, and representatives from the Royal British Legion and the Army Reserve.

It was performed by Rev Jan Ashton, Team Vicar from Kidderminster. Lt Col Simon Halliday TD RA, Morgan's Director of Strategic Programmes who also serves in the Army Reserve, laid the wreath on behalf of the company.

The six – Robert Edward Burrows, Albert Walter Farley, Charles Edward Hinton, Thomas Moule, Thomas Henry Vale and Robert Wilkes – were among dozens of employees of the then ICI Steatite facility called up for active service in World War II.

The memorial, originally erected in the 1950s, was sensitively relocated a few years ago when the construction of new housing began nearby and is now located by the new main entrance to the Morgan facility. It has been topped with a new memorial stone provided by Morgan Advanced Materials to ensure the historic integrity of the memorial is respected and preserved for many more years to come.

Paul Manison of Morgan Advanced Materials explained: "With this year marking the 70th anniversary of the end of World War II, it seemed an appropriate time to rededicate the war memorial. Six men from the company which has become Morgan Advanced Materials lost their lives serving their country and the memorial serves as a constant reminder to all our employees and visitors of the ultimate sacrifice they made."

Morgan announces high purity CVD silicon carbide material ideal for semiconductor equipment components

April 2015

Morgan Advanced Materials announces the availability of high purity chemical vapor deposition (CVD) silicon carbide (SiC), a material ideal for semiconductor equipment components. Morgan offers precision-machined RTP edge rings along with gas distribution plates and focus rings for plasma etch. Also available are metal organic chemical vapor deposition (MOCVD) components used to manufacture light-emitting diode (LED) lights.

The freestanding monolithic CVD SiC material is available in two grades. HR SiC (High Resistivity), a black material optically translucent in thin sections, has an electrical resistivity greater than 1 ohm-cm (ohms centimeter) and is 99.9995 percent pure. ELR SiC (Engineered Low Resistivity) is 99.9999 percent pure with a bulk resistivity of <0.1 ohm-cm, making it ideal for RF (radio frequency) coupling in the chamber.

Morgan's patented Rmax process makes near net shape fabrication possible, driving down costs by minimizing the need for time consuming and expensive SiC machining. Compatible with many industry forming processes, the near net shape ring production greatly improves the production of silicon carbide parts with ring shapes. Along with the significant price advantages stemming from its near net shape capabilities, Morgan also has unique capabilities in large capacity CVD processes, and large area, thick CVD materials. Using advanced CVD SiC manufacturing technology to supply the high performance CVD SiC components required by the semiconductor industry, Morgan produces material with high thermal conductivity and high resistance to corrosion, wear, and abrasion. Parts made of CVD SiC last longer than those made of other materials, reducing warranty costs.

The extremely durable, non-particle generating material is ideal for the ultra-clean environment of semiconductor manufacturing facilities. The SiC components stand up well to the plasmas and acids used in semiconductor processing and cleaning.

Morgan's proprietary oxidation and etch process reduces the number of high energy particles on the surface, smoothing out the surface on a molecular level. World class ultrasonic drilling can produce gas distribution plates with holes as small as 0.5 millimeter, and electric discharge machining (EDM) is available to produce detailed features. Precision hard grinding and high tolerance CNC machining round out Morgan's machining expertise.

Morgan Advanced Materials offers multi-layer ceramic piezoelectric actuators for displacement devices

April 2015

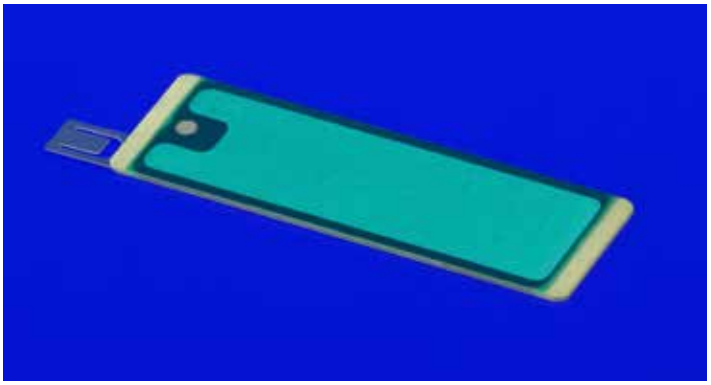
Morgan Advanced Materials is helping meet the growing global demand for precise, controllable and repeatable displacement devices in the micrometer and sub-micrometer range with its co-fired multi-layer ceramic piezoelectric actuators.

The actuators multi-layer structure allows devices to generate large mechanical strains at relatively low voltages, making them ideal for optical and medical instrumentation, valves, printers and nano/micro positioning applications, as well as position control, detonators, hard disc drives, and pumps.

With more than 55 years of experience in the development and production of electroceramic materials and components for the electronics industry, Morgan combines its piezoelectric materials expertise and multi-layer capacitor production techniques to offer a wide range of multi-layer piezoelectric ceramic actuators.

The actuators are capable of finely controlled micron activation in expansion, kilo-newtons of force, and tens of microseconds of response time. In addition to a standard range, custom actuators with smaller surface areas or those with greater height and displacement can also be developed. Morgan's piezoelectric ceramic multi-layer actuators consist of many thin layers of piezoelectric material interspaced with metal electrodes. They are co-fired mechanically and supplied in series or parallel circuitry.

The actuators can be supplied as assemblies consisting of a single or stacked actuator. Each actuator assembly is manufactured with protective ceramic end plates for wear resistance and electrical insulation, as well as a conformal epoxy coating for electrical insulation. They can be equipped with insulated copper wire leads and a dielectric coating, with an inactive ceramic insulation layer at the top and bottom. To ensure reliability in service, Morgan conducts comprehensive in-house testing of all its multi-layer actuators.



Morgan unveils 3D engineered super insulation solution

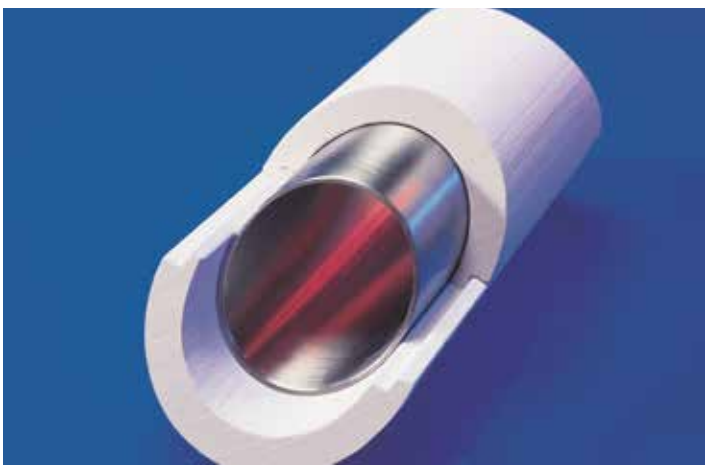
April 2015

Morgan Advanced Materials has revealed its latest super-insulation technology in the form of WDS® UltraShell®. The innovative new product, WDS UltraShell, is a high-performance, rigid microporous machined shell insulation system for piping insulation developed by engineers at the Group's Porextherm business. Offering extremely low thermal conductivity values across a wide temperature range, it provides outstanding insulation performance, up to five times better than that of conventional insulators.

WDS UltraShell is available in a wide range of diameters, thicknesses and frame designs, preventing the additional cost and inconvenience of adding flexible materials to achieve thicknesses above 25mm, or to insulate large diameter pipes. It offers perfect sealing around a pipe with easy and fast handling, installation and fixing as it is easy to cut and preform on site. Compared with other microporous insulation products on the market, WDS UltraShell boasts superior mechanical strength with lower density as well as remarkably low and flat thermal activity.

Supporting a range of space and weight reduction needs, WDS UltraShell offers excellent thermal stability and dimensional integrity at temperatures up to 1,000°C. At the core of WDS UltraShell is a reinforced blend of opacified premium grade inorganic silicates and pyrogenic silica. The homogeneous, compact and robust matrix core allow the product to remain stable even in high operating temperatures, with negligible shrinkage. Guido Chiappano of Morgan Advanced Materials said: "Demonstrating proven technology that outshines the competition, our latest product exceeds all standards. WDS UltraShell provides businesses with a new standard of insulation, reducing weight, volume and energy consumption, whilst reducing whole life costs."

The product is environmentally safe, being free from respirable fibre, rutile (TiO_2) and other hazardous substances, and complies with both the standard specification for microporous insulation ASTM C1676 and ISO standards.



Morgan's Seals and Bearings receive favorable FDA letter of opinion for use in food processing applications

April 2015

Morgan Advanced Materials announces it has received a favorable letter of opinion from the U.S. Food and Drug Administration (FDA) for a variety of its carbon/graphite, sintered silicon carbide, and reaction bonded silicon carbide materials produced by its Seals and Bearings business. The letter of opinion covers repeated-use, wear components for food applications, including mechanical face seals, bearing, bushings, vanes, and rotors.

Previously acknowledged as the GRAS (Generally Recognized As Safe) designation provided by FDA, the letter of opinion offers a level of comfort to equipment manufacturers and their end user customers that the materials are considered safe by experts.

Morgan's carbon/graphite and silicon carbide materials possess superior tribological and wear characteristics, making them a great choice for mechanical seal faces and bearings. They are ideally suited for use in food industry pump and mixer applications because of their dimensional stability and chemical inertness. They are also a great choice for high temperature ovens in which seal faces come into contact with food products, which precludes use of typical lubricated bearings.

Carbon graphite also contains outstanding thermal properties and resilience, making it an exemplary material for components exposed to extreme temperatures, speeds, and a variety of corrosive fluids. Morgan's materials are corrosion resistant at varying pH levels. They can be submerged in liquid without shedding debris, unlike other lubricated seals and bearings.

Morgan's application engineers work closely with customers to tailor materials for specific applications, guaranteeing a perfect match for use in the end application.

Strategic partnership enters third decade

April 2015

Morgan Advanced Materials

CERTECH

A strategic and mutually beneficial partnership between Morgan Advanced Materials' Certech business and one of the world's premier manufacturers of turbine blades continues to go from strength to strength as it enters its third decade.

Based in Leeds, AETC Ltd, part of PCC Airfoils LLC, manufactures a variety of blades for the aerospace and industrial gas turbine sectors which are supplied to major names worldwide.

The need for precision in the blade manufacturing process is key given the high costs of the nickel- and titanium-based alloys used, the costs of reworking, and the cost of a lost component if the stringent tolerances demanded in these sectors are not met.

This makes the accurate and consistent manufacture of the ceramic cores which determine the inner shape and geometry of the blades vital – and PCC's key partner for these products is Morgan's Certech business, based at Corby and Derby in the UK.

The relationship has been in place for more than 20 years but has deepened significantly in the last two years as AETC has initiated no less than nine new blade programmes, each requiring the detailed design and manufacture of cores in Morgan's proprietary K120 ceramic material. K120 directionally solidified single crystal material boasts excellent high-temperature stability, making it ideal for use with alloys requiring high-temperature pre-heats. For each new blade design, Morgan's dedicated team is required to design and test prototype cores to prove that they meet profile tolerances which can be as tight as +/- 0.08mm.

Brenda Nichols, Group Purchasing Manager at AETC Ltd, explained: "Over the years we have worked with a number of core suppliers but in recent years have made Morgan one of our key business partners. While their pricing is competitive, what has been far more important to the development of the partnership has been their technical capability, partnership-led approach and willingness to go the extra mile.

"Whenever we have introduced a new product - and there have been many recently - the Morgan team pull out all the stops to get the new cores designed and manufactured so we can begin casting. Currently we are manufacturing 30-40 different blade designs, each with their own discrete core design, and Morgan's responsiveness and agility ensures there is minimal interruption to the casting process."

Robert Park of Morgan added: "As a supplier to some of the biggest names in global industry, AETC cannot afford to miss a deadline when it comes to delivering blades. Our role is to ensure not only that they have the cores they need, when they need them, but that each core conforms to stringent design parameters".

25-Year partnership demonstrates Morgan's material expertise

April 2015

The use of radiotherapy has become established over the last 25 years as a major tool in the fight against cancer but it is acknowledged that its effectiveness is only as good as the tools used to deliver it.

By far the most common is a couch on which the patient lies while the treatment is delivered from both above and below. The most important attribute of the couch top is its ability not to deflect or sag when mounted by the patient, ensuring the treatment is then delivered to precisely the intended location. For many years, the most common material for the couch top was timber, but it was becoming clear that even the hardest of woods was not able to offer the requisite strength, rigidity or consistency required. This meant the possibility that treatment may be inadvertently applied to the wrong areas, rendering it ineffective with considerable cost to the hospital.

Varian Medical Systems, the world's leading manufacturer of radiotherapy delivery systems, felt that a more advanced material was required, able to offer greater homogeneity with minimal but measurable deflection under pressure, while minimising weight as far as possible to enable advances in delivery capability

The Varian team consulted the Composites and Defence Systems (CaDS) business of Morgan Advanced Materials (then NP Aerospace) who recommended the use of a carbon fibre base. Carbon fibre boasts a number of attributes making it ideal for this type of application.

After the initial recommendation Morgan worked to develop a suitable solution and manufacturing process that met the exacting requirements of Varian. The company has invested in its research and development capability and cleanroom manufacturing facilities in Coventry, UK, enabling it to offer the latest in material enhancements and manufacturing process innovation to Varian. They produced a moulded component with no inclusions, which offers optimised image quality.

The two businesses have worked in partnership for more than 25 years, with Morgan supplying more than 11,500 carbon fibre couch tops to Varian during this time, making it one of the company's longest-standing and most loyal customers. This long-term relationship was recognised in 2012 when Morgan was named as Varian's UK Supplier of the Year, from more than 100 suppliers.

The partnership has been instrumental in optimising productivity and performance in hospitals worldwide. Vital to its success has been Morgan's quality, delivery and responsiveness, with the design of the couch tops evolving to meet the needs of ever-changing treatment methods.

Extensive process development and testing has resulted in a high level of homogeneity, resulting in consistent, repeatable performance across components and batches. The couches are also highly radiotranslucent (x-ray transparent), meaning they only absorb a minimal amount of the radio waves, so that the highest quantity of radiation reaches the patient. Perhaps most important, though, is the strength and rigidity of the end product, meaning that it will deflect by no more than 4 or 5mm even when holding a very heavy patient. The current optimised structural design features a precise fibre orientation in lay-up, with highly accurate moulded geometry requiring minimal machining, reducing part costs for Varian.

This success has led to the carbon fibre base becoming the material of choice for all of Varian's linear accelerator treatment equipment in addition to the original application of imaging on radiotherapy simulators which help to assess the position of the tumour and the best means of treatment delivery.

Duncan Eldridge, President of Morgan's CaDS business, commented: "Morgan is proud to continue to support Varian's pioneering work in saving lives through the research into and treatment of cancer."

Optimising sensor performance in the beverage processing sector

April 2015

Ever-changing and more exacting operating conditions in the food and beverage processing sector are placing greater demands on the sensors that take the measurements that are vital to safe and effective operation.

Higher operating temperatures and pressures, as well as the presence of steam and potentially corrosive products such as alcohol and solvents, are accompanied by a need to ensure unplanned interruptions to production do not occur, while the drive for smaller machine footprints means sensors must take up as little space as possible.

It is this unique combination of circumstances which is behind the increased specification and use of ultrasonic sensors, whose unique attributes enable them to deliver optimum performance across a broad spectrum of applications, including highly accurate metering and level measurement.

One of the key challenges is in the area of materials choice, where only pre-agreed 'food safe' products may be selected. However, an extensive range of high-specification ceramic and stainless steel materials are now available combining food safe standards with optimum performance.

In applications such as milk metering and beverage dispensing, accurate sensing is key to ensure the correct filling of containers. Systems can operate at pressures of up to 50 bar due to the high-specification pumps used to maximise fluid throughput, but with sensors only able to be around 10mm in diameter due to the space constraints within most processing systems, materials which are thin yet physically robust have to be selected – meaning highly sensitive ceramic transducers are frequently the only option.

Positive displacement meters which consist of two cogs, are used in many applications but cannot distinguish between fluids and gases, causing severe measurement error if any air is trapped in the system. Furthermore, the frictional method of operation of these systems can potentially result in smaller particles breaking off from the sensor body and entering the fluid being processed, with potentially serious ramifications for the end consumer – and therefore for the processor. Not only can ultrasonic sensors distinguish between fluids and gases – ensuring accurate dosing – but the sensing option is solid state technology, eliminating all moving parts and preventing any sort of wear. They are also chemically inert, meaning they will not be adversely affected by the presence of alcohol or solvents.

A meter able to operate in high temperature applications up to 150°C has traditionally been accompanied by a premium price, with the most common choice being a coriolis flow meter. These products are without doubt highly accurate but, in tandem with their cost, their footprint is significantly larger than that of alternative technologies such as ultrasonic sensors, creating major headaches for system designers.

Other technologies commonly used in food and beverage applications include electromagnetic flow meters. However, due to their mode of operation, these systems are only suitable for use with conductive fluids, limiting their effectiveness and meaning the only option for use with fluids such as sterilised water is an ultrasonic sensor.

Ultrasonic sensors are not just used to control the flow of materials within the process itself. Just as important is ensuring processing equipment can operate safely, effectively and without interruption. As in any production process, an appropriate lubrication regime is key, with insufficient lubricant likely to lead to overheating, physical damage to equipment, and unscheduled downtime. Many applications also require the use of coolants. Once again, the small footprint of ultrasonic sensors allows them to be located, for example, within gearbox housings where they can provide real time information on coolant or lubricant levels, feeding this data back to the control room and informing decisions on when a top-up or replacement will be needed.

With high sensitivity, wide bandwidth, and stable electrical properties demonstrated even at very high temperatures and pressures, ultrasonic sensing represents the only option for specifiers requiring optimum accuracy and physical performance in these highly demanding applications.

Also available from Morgan Advanced Materials is a range of high quality mechanical face seals, bearing, bushings, vanes, and rotors, ideal for use in fluid processing applications, manufactured from a variety of carbon/graphite grades, and silicon carbide which have received a favourable letter of opinion from the US Food and Drug Administration (FDA) for use as repeated-use, wear components in food applications.

Morgan announces CVD PBN crucibles for compound semiconductor manufacturing

April 2015

Morgan Advanced Materials announces the availability of high purity chemical vapor deposition (CVD) pyrolytic boron nitride (PBN) for crucibles used in compound semiconductor manufacturing. Morgan's PBN material is ideal for crucibles used in single crystal gallium arsenide (GaAs) growth, organic light-emitting diode, (OLED) cathode deposition, and molecular beam epitaxy (MBE). Morgan's PBN material is also perfect for coatings on graphite for high temperature heaters.

Morgan's engineers work with customers from design to production to provide PBN crucibles that are manufactured in a wide range of sizes and configurations, in high volume and with a consistent quality. Crucibles made with Morgan's PBN material feature ultra-high purity (greater than 99.99 percent) and chemical inertness to most acids, alkalis, organic solvents, metals and graphite. Non-toxic and non-wetting, the material offers uniform heating within crucibles, reducing growth rate variation. With an anisotropic thermal profile, the material is thermal shock resistant and has a high volume capability.

Morgan's PBN material features high thermal conductivity in the "a" direction and an extremely high working temperature (greater than 1500°C/2732°F). It also has a high electrical resistivity (greater than 1015 ohms per centimeter), as well as high dielectric strength. Low out-gassing at elevated temperatures and good flexural strength with high compressive stresses makes it an excellent material for a range of crucibles. Morgan has extensive experience with MBE, widely used in the manufacture of semiconductor devices, including those used in smart phones and Wi-Fi equipment. MBE crucibles, used to vaporize such materials as Gallium (Ga) and Aluminum (Al) for epitaxial growth compound semiconductors, feature high purity, anisotropic thermal properties, chemical inertness, thermal stability and thermal shock resistance. Morgan's MBE crucibles will not contaminate the deposition system and exhibit uniform temperatures within the crucible, offering a long life and cost savings.

The MBE crucibles are available in a variety of formats, including MBE epitaxy, liquid encapsulated Czochralski (LEC) and vertical gradient freeze (VGF), and a wide range of sizes.

Cutting edge investment from Morgan Advanced Materials

April 2015

Morgan Advanced Materials has responded to increased customer demand with a further major investment in state-of-the-art production equipment at its Composites & Defence Systems business in Coventry.

A six-figure sum has been invested in a new high-specification water jet cutting machine which is further optimising cutting quality and consistency while also improving throughput.

The Coventry facility is established as a global centre of excellence for composite materials and has specific expertise in the production of armour systems to protect both individuals and vehicles. Accurate cutting is crucial to finished product quality and performance and the water jet cutter accurately recreates CAD designs in a variety of materials from fibre glass and commercial composites to the high-protection materials used in the international defence sector. Duncan Eldridge, President of Morgan Advanced Materials - Composites & Defence Systems, explained: "Much of our cutting was previously undertaken manually but business growth and increased demand have driven the latest investment to automate and so speed up processing. The new equipment is guaranteeing cutting consistency and quality across a broad range of applications, enabling us to maintain the reputation for quality we have developed over many decades."

Morgan helps set new world record at London Marathon 2015

April 2015

Major Iain Church has broken the world record time for completing a marathon wearing a bomb disposal suit. The suit was supplied by Morgan Advanced Materials.

After a team of current British Army officers secured the world record for completing a marathon wearing a bomb disposal suit back in 2012, they set themselves the challenge of beating their original time (6 hours 55 minutes and 59 seconds) in a bid to raise money for the Royal British Legion.

Major Iain Church took part in the 2015 London Marathon wearing a full bomb disposal suit. Similar to those currently in service with the MOD, the suit is typically worn to give protection in the event of a blast. Including the helmet it weighed 30kg (66lbs) and is designed with cutting-edge materials technology and garment engineering, resulting in the highest levels of protection, and maximum comfort and mobility for the user.

Iain was supported on the route by Major Nigel Marsh, Colonel Damian McKeown and Lieutenant Colonel (Retired) Marc Finch. With safety a key consideration, the team remotely monitored Iain's internal body temperature using an internal thermometer – swallowed before the event. The team was on hand to co-ordinate the speedy removal of the bomb suit and the application of ice packs or iced water to cool Iain down sufficiently to resume running should his body temperature have risen above 39.5°C; emergency cooling procedures were only required once, at mile 23.

In completing the London Marathon, Iain and his team were hoping to achieve two aims. The first was to raise as much money as possible for The Royal British Legion, a charity that has supported members of the armed services and their families for generations; the second was to break their own world record, ideally setting a new world record of 6 hours 30 minutes or less.

Iain was successful in his record attempt, registering a time of 6 hours, 28 minutes and 6 seconds. Commenting on his achievement, he said; "I'm absolutely over the moon that we were able to beat the previous world record by more than 27 minutes. A special thanks to my team, and to Morgan Advanced Materials for designing such an impressive piece of kit, without which none of this would have been possible. Fundraising has gone really well and is still ongoing; the team giving page is http://uk.virginmoneygiving.com/BombSuitChallenge."

Morgan Advanced Materials has a longstanding history with the armed forces, supporting them through the design and manufacture of lightweight, high-protection armour systems for vehicles and personnel.

Morgan's fuel flow sensors keeps motorsport moving

April 2015

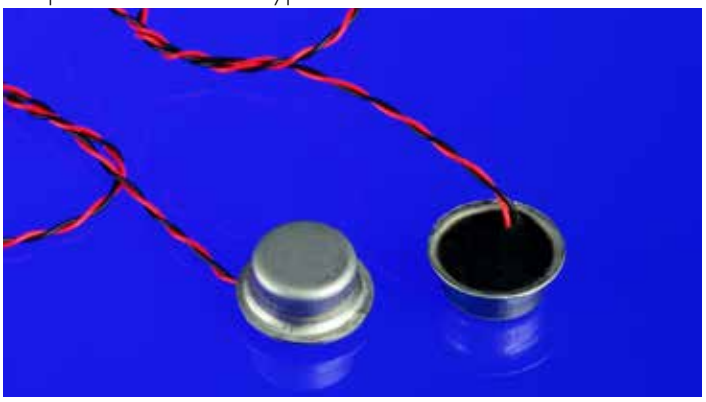
Morgan Advanced Materials and Sentronics have been working together to create a new fuel flow sensor which is providing motorsport manufacturers with accuracies of +/- 0.25 per cent, an industry-leading innovation which is contributing to increased control over fuel consumption.

Designed to help promote energy efficiency in motorsport by measuring fuel flow as part of limiting total energy use, the fuel flow sensor is appropriate for all categories of motor racing, including touring and rally cars, as it can accurately measure flow rates of +/- 8,000ml per minute, across a temperature range of 0°C to 105°C. Weighing in at just 330g – far less than the 500g maximum weight permitted by the Fédération Internationale de l'Automobile (FIA) – the sensor provides an exceptional degree of accuracy without adding unnecessary weight to the vehicle.

The fuel flow sensor is capable of operating in fluid pressures of 50kPa to 2,500 kPa and an external pressure rating of 300kPa, making it ideal for harsh vehicle applications. Intelligent on-board electronics process volumetric flow values and compute a mass flow output.

Charles Dowling of Morgan explained: "Sensor functionality in motorsport is crucial, as teams risk disqualification if they cannot efficiently balance performance and fuel consumption. In this case Morgan have managed to provide a highly responsive sensor to combine with Sentronics flow meter, creating a revolutionary new product. Morgan and Sentronics have worked together to turn this project around in only a few months, showcasing the responsiveness necessary to meet the tough demands of the motorsport industry." "Sentronics have optimised the electronics around the sensor to create our most accurate readings to date – twice as sensitive as some mass flow meters available and at a much lower cost. This ground breaking technology is extremely exciting and could have a very significant impact on how everyday automobiles work today."

Manufactured from highly engineered materials including anodised aluminium alloy with stainless steel to form a compact and lightweight unit with no moving parts, the sensor is compatible with all fuel types.



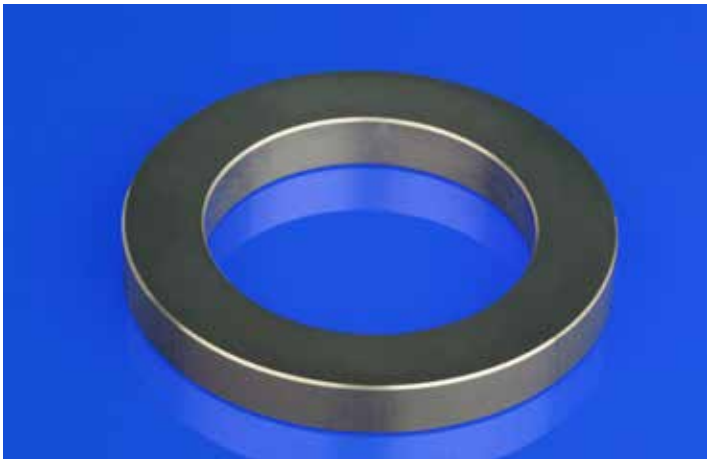
Morgan Advanced Materials offers seal face component materials ideal for non-contact seal applications

May 2015

Morgan Advanced Materials' Seals and Bearings business announces the availability of high performance materials ideal for seal face components in non-contact seal applications. The range of carbon graphite and silicon carbide materials feature high mechanical strength and highly predictable performance, making them a good choice for mechanical non-contacting gas seal applications in oil and gas, energy, chemical processing, and industrial markets.

With more than 30 years of experience manufacturing seal components, Morgan's process yields materials with high mechanical strength, a high modulus of elasticity, and uniformity throughout the matrix – features integral to an elevated level of performance in the end application.

Morgan's Applications Engineers work closely with customers to determine key variables including; the gas type to be sealed, the operational temperature and speed, the sealing pressure and any abrasive contaminants the components may be exposed to in order to ensure the right material is chosen. Working with customers throughout the entire manufacturing process, Morgan can provide samples and manufacture at either low or very high volumes.



Graduates back Morgan scheme in Top Independent awards

May 2015

Leading materials science and engineering company Morgan Advanced Materials has received further recognition of the quality of its programme to attract and retain the highest-calibre graduates to the company – this time as a direct result of feedback from the graduates themselves.

At the annual 'Top Companies For Graduates To Work For' ceremony, organised by The Job Crowd and held at the Intercontinental Hotel in Park Lane, London, it was revealed that Morgan had reached number 16 in the 'Smaller Intake' category – a rise of a massive 47 places over the previous year.

This rise also put Morgan at number 2 in the Engineering & Manufacturing sub-category, up five places compared with last year. Morgan's current Graduate Leadership Programme (GLP) has been in place since 2012, with 11 new graduates joining the scheme in 2014/15. The company has run graduate schemes for more than two decades – however, launching the new Graduate Leadership Programme in 2012 to improve the leadership development structure has been a key focus. The company sees its GLP as a key contributor to the recruitment and delivery of top leadership talent into key areas of the business.

Feedback from scheme participants, received anonymously, included comments such as: "The best thing about working for Morgan is the opportunity to work within a truly global business; with unrivalled exposure to all the business units, and regular access and coaching from senior management from day one. In addition to this, the experience of working on challenging and stimulating projects with real accountability and responsibility is a real advantage." Jane Edmondson, European Graduate Programme Manager at Morgan Advanced Materials, explained: "The 'Top Companies For Graduates To Work For' scheme is recognised as the premier independent barometer of graduate employment programmes. To have achieved such a significant rise in the annual league table this year is a testament to the commitment we have, as a business, to attracting outstanding talent - and giving them the opportunity to develop a long-term career as a future leader with Morgan."

This is not the first time that Morgan's commitment to people development has been recognised in recent time. 2014 saw thecompany named Regional Winner of the Developing People Award at the national EEF Future Manufacturing Awards.

Morgan announces ceramic hermetic seals and insulated feedthroughs made of machineable glass ceramic

May 2015

Morgan Advanced Materials announces the availability of hermetic seals and insulated feedthroughs manufactured from MACOR® machineable glass ceramic. With a high glass content and high coefficient of thermal expansion, MACOR's exceptional electrical properties have made it the natural choice for a wide variety of electrical insulation applications. The material's high dielectric strength and electrical resistivity make it ideal for use as a precision electrical insulator at high voltages, various frequencies, and high temperatures.

MACOR can be quickly and inexpensively machined into complex shapes and precision parts. Machining can be performed with standard carbide tools to create complex objects to the tightest of tolerances, making it ideal for manufacturing prototypes with a fast turnaround. Requiring no post-firing after machining and exhibiting no post fabrication shrinkage, parts can be manufactured quickly whilst meeting demanding specifications.

Readily matching most metals and sealing glasses, MACOR facilitates hermetic seals directly to a variety of metals, including platinum, titanium, Dumet copper-clad wire seal, chrome-iron stainless, alloy 52 (50.50% nickel-iron alloy), and Sylvania #4, as well as to Forsterite ceramic. A range of sealing glasses is used to ensure that desirable properties are achieved without compromising effectiveness. Vacuum tight seals can be achieved for high temperature applications.

With zero porosity and tight tolerance capability, MACOR has a continuous use temperature of 800°C and a peak temperature of 1000°C. The material is non-wetting, exhibits zero porosity, and unlike ductile materials, will not deform. When properly baked out, it won't outgas in vacuum environments.

Morgan helps eliminate RCF usage for leading global aluminium processor

May 2015

The innovative approach and use of state-of–the-art technologies by Morgan Advanced Materials is helping to deliver significant operational and health & safety benefits for one of Europe's leading players in the flat rolled aluminium sector.

Morgan's Thermal Ceramics business has enjoyed a working relationship with Hydro Aluminium spanning more than two decades, providing not just products but a range of technical support and advice to assist the company in its drive towards continuous improvement in its manufacturing processes. Morgan has for many years supplied a range of refractory ceramic fibre (RCF) caster tips for the company's continuous aluminium casting process.

The depth of the partnership between the two companies is exemplified by the visits made by Morgan's own team to Hydro Aluminium's Karmøy Norwegian facilities to gain as full an understanding as possible of how the company uses the Morgan products, and why the detailed specifications provided by Hydro Aluminium are so crucial to the success and quality of the manufacturing process. Meanwhile, the two companies' research & development teams have forged a close partnership, with a number of ongoing joint projects and product testing initiatives.

The most recent project has seen Morgan support Hydro Aluminium in its drive to move away from RCF caster tips to help optimise on-site health & safety. Caster tips play a key role in feeding the aluminium into large steel rollers which roll the material to the required thickness.

Based on Morgan's understanding of Hydro's processes and pioneering work in vacuum-formed fibre product development, the Hydro team consulted Morgan about the possibility of manufacturing caster tips in other materials. They wanted something which would deliver the same thermal expansion, hardness and density specification as the previous RCF-based products, while also leaving a very clean, dust- and mark-free surface after machining, all at a competitive cost.

Most importantly, any alternative material needed to be exonerated from carcinogen classification under Nota Q of European Directive 67/548. This would ensure that REACH authorisation will not be a problem, a concern arising following the inclusion of Refractory Ceramic Fibres on the SVHC list in 2009 and its subsequent recommendation for authorisation in 2013 (an European Commission decision is awaited on confirming the inclusion of RCF on the authorisation list).

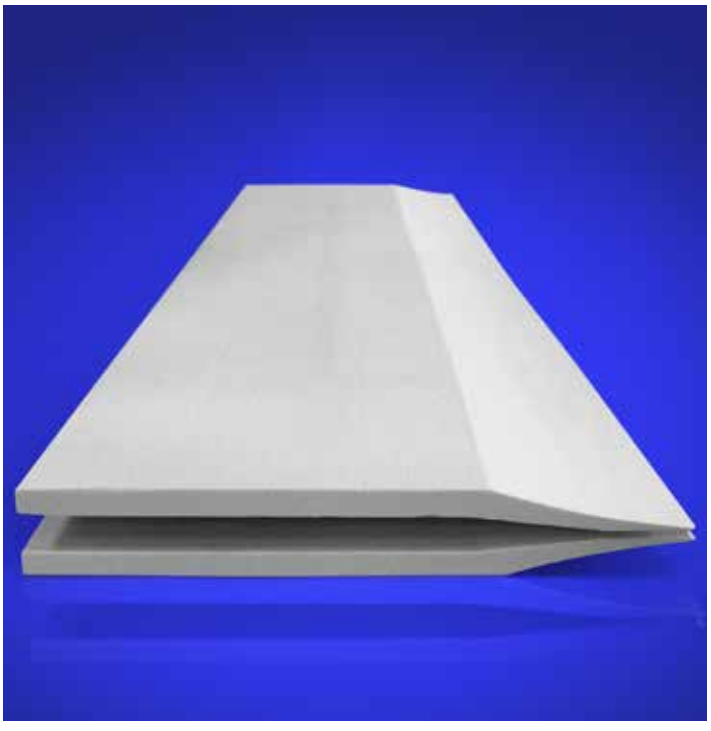
Drawing on the extensive expertise of its European research & development teams, and working in close collaboration with their counterparts at Hydro Aluminium, Morgan developed a range of bespoke caster tips made from its low biopersistent Superwool fibre range. Morgan created a special formulation of Superwool fibre for this application and even modified its production process to eliminate the possibility of the 'shot' within the fibre creating marks on the aluminium being processed.

The new products soon became a success following extensive casting trials, resulting in the elimination of all RCF materials from Hydro's production plant in Norway.

As a direct result of this project, Morgan has been invited to join Gesamtverband der Aluminiumindustrie (GDA), a European association of organisations involved in aluminium production and processing,

Morgan also now believes that there are other opportunities for the Superwool fibre caster tips with other companies with similar goals to Hydro Aluminium. Hydro, meanwhile, remains a loyal user of other Morgan products such as low biopersistent board products and components for launder systems, distribution boxes and baffles.

Jakob Sandvik Kvalevåg of Hydro Aluminium explained: "Our commitment to eliminating RCF usage in our facility is matched by Morgan's own dedication to developing a bespoke material for our caster tips which is able to deliver optimum performance in high temperatures. As a truly RCF-free facility, we can demonstrate that we have the welfare of our employees at the core of what we do."



Morgan Advanced Materials announces TR Block Insulation products with excellent strength and insulation and low environmental impact

May 2015

Morgan Advanced Materials' Thermal Ceramics business announces the availability of TR Block Insulation products, which feature excellent physical and thermal insulating properties, while maintaining a low environmental impact. TR-19TM and TR-20TM structural block insulation is ideal for side and end wall insulation in carbon baking pits, backup insulation in aluminum pot cells, reheat and pusher furnaces, copper reverberatory furnaces, and oil-fired water tube boilers. They are an excellent low-cost insulation option, especially as a replacement for mineral wool panel insulation, and are good for interior and exterior use on bustle pipes, hot air pipes, stacks, and other curved or circular equipment.

With lower thermal conductivity than competitive offerings, the TR block insulation products reduce energy waste by improving the heat loss through the insulation lining. The lower weight of the material maintains high compression strength, with minimal shrinkage at its working continuous use temperature.

Morgan's TR-19 and TR-20 structural block insulation products are available in a range of sizes and thicknesses up to 7-inches with either beveled or straight edges, and can be manufactured in special shapes, saving money on both installation and energy costs. They feature a unique composition and hard surface that helps ensure strong adhesion of cement finishes, and provides superior handling qualities.

TR-19 block is manufactured from vermiculite granules and high temperature bonding materials. Because of its low conductivity, TR-19 block is an economical, energy saving insulation that exhibits minimal shrinkage at its 1900°F (1040°C) temperature limit. It will not readily decompose, even when exposed directly to flame or cryolite vapor conditions. The high strength version, TR-19HSTM, is suitable where mechanical loads are present.

TR-20 block, made from diatomaceous silica with a hydraulic binder, is a superior, high-temperature insulation for service to 2000°F (1095°C). TR-20 demonstrates extremely high resistance to breakage to 2000°F (1095°C). Long, maintenance-free service and maximum operating efficiency is assured by TR-20's unique combination of low conductivity and high stability. It is also very low in sulfur and iron, making it highly resistant to attack from atmospheric conditions and greatly reducing the possibility of product contamination.

New current collectors offer optimised performance and longer service life

May 2015

Morgan Advanced Materials has developed a new, lighter weight, metallised current collector strip, based on proprietary material technology, which is set to bring a wide range of benefits for the rail sector.

The incorporation of the new material from Morgan's Electrical Carbon business has enabled the width of a collector strip to be increased by 40 per cent from 30mm to 42mm. This delivers a typical 35 per cent extension of product service life and enhanced reliability, with negligible weight increase.

The collector strip also boasts an arc protection system, with an engineered coating applied to the metal, with the effect of drawing any arcing to the carbon strip – a key attribute, especially in wet and wintry conditions which can create a barrier to power transfer and result in localised overheating of the metal support carrier. The arc protection system maximises collector strip life, reduces maintenance and running costs for rail contractors while delivering improved service performance to passengers as the collector strips require less frequent changing, drastically cutting downtime.

The new collector strips are based on Morgan's unique and proven method of transferring high currents to give a low resistance current path in bonded collectors, resulting in an innovative yet lightweight solution for overhead current collector applications.

Delivering low friction for long overhead wire life, Morgan's carbon and metallised carbon current collector strips offer high performance in both pantograph and third rail applications. The company's comprehensive range includes collectors suitable for overhead, third rail and trolley bus shoes on metro systems, high-speed trains, trams and trolley buses.

New piezoelectric materials are ideal for high-temperature operation

May 2015

Morgan Advanced Materials has launched of a range of piezoelectric materials that deliver reliable sensing and monitoring in high-temperature environments above 200°C.

Based on the proven properties of lead zirconate titanate (PZT), the new materials are suitable for both vibration and pressure sensing for applications in process & plant control, power generation, automotive and aerospace.

Also ideal for long-term non-destructive testing (NDT), they allow in-situ continuous fault detection at temperatures of up to 250°C.

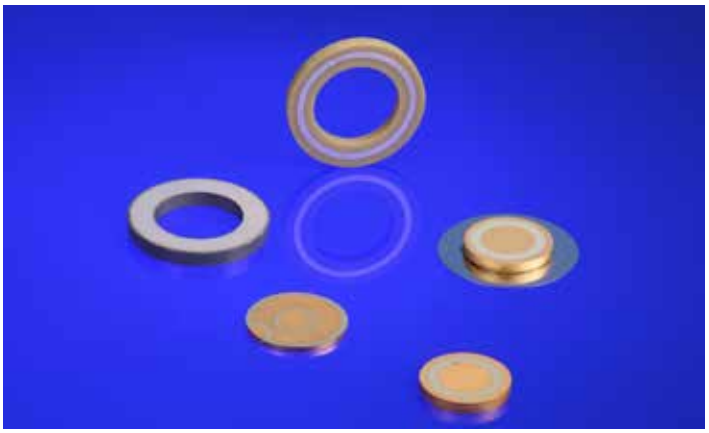
Previous materials of this kind have had to offer a compromise between piezoelectric activity and maximum operating temperature, with rapid thermal degradation taking place at temperatures above 200°C.

However, the new products are temperature-stable and rated for continuous use at up to 250°C with an intermittent maximum of 300°C. Available in tailored formulations, they boast piezoelectric charge coefficients (d33) exceeding 400pc/N.

The use of modifying dopants to produce both soft and hard materials enables further customisation of performance attributes, extending performance boundaries. Testing has also shown outstanding resistivity at elevated temperatures, enabling a large sensing bandwidth in high-sensitivity applications.

Paul Turnbull of Morgan Advanced Materials explained: "In-house testing of the new materials has shown that at 250°C, the decrease in piezoelectric properties is negligible, making this technology suitable for a far broader range of applications. This temperature stability is highly significant in sectors where continuous operation or prolonged electrical/ stress/ cycling is vital to device construction and operation."

Morgan offers dedicated in-house fabrication capabilities for the manufacture of products with diameters between 200μm and 200mm.



New automotive sensors deliver unrivalled accuracy and performance

May 2015

Morgan Advanced Materials has introduced a versatile new range of high-specification sensors specifically developed to meet the exacting requirements of the global automotive sector.

Designed for high-volume manufacture, the new sensors can measure levels from as low as 5mm to more than 250mm within fractions of a millimetre, making them ideal for fuel tank gauging, oil level detection, gearbox oil measurement and a host of other applications.

They combine state-of-the-art engineering and materials technology with highly chemically resistant wires in a unit with no moving parts, guaranteeing long service life and unrivalled accuracy.

Boasting strong tilt resistance, angular directivity and vibration resistance, they are equally suitable for use in cars, commercial vehicles and even off-road vehicles. Customised models are available to cope with greater depths, complex fuel tanks and high-pressure oil environments.

Charlie Dowling of Morgan explained: "Traditional sensors in the automotive sector are typically either mechanical – with moving parts which can wear over time due to friction – or have a ball valve mechanism, which has a larger footprint. However, our new sensors combine exceptional accuracy and durability in a compact and cost-effective package.

We are keen to speak to both OEMs and Tier 1 suppliers seeking to offer the very best in sensor performance to their customers."

Morgan leads the way in production of large dimension (NAVY I) PZT Blocks

June 2015

In a major breakthrough for the technical ceramics sector, Morgan Advanced Materials is manufacturing what are believed to be the world's thickest piezoelectric ceramic blocks.

The blocks, designed for use in ultra-low frequency SONAR applications down to 18KHz, are made of high-quality, hard (Navy I) lead zirconate titanate (PZT) - Morgan's own proprietary formulation, known as PZT401. They offer superb electrical characteristics, are of high sintered density and are suitable for the manufacture of wide bandwidth 1-3 composite transducers for deep sea applications.

However, the most striking feature of the new PZT ceramic blocks is their size, and in particular their thickness, reaching a current maximum of 42mm. Various combinations of length and width are available on request. The ability to manufacture and polarise such large thicknesses of piezoelectric materials sets Morgan apart from its competitors and represents a step change in the industry.

"Our philosophy is to push the boundaries in the manufacture of large piezoelectric components and to support the next generation of ultra-low frequency, high resolution SONAR equipment for deep sea applications. I do not know of any other company that is producing piezoelectric components to such demanding thickness specifications," commented Frédéric Pimparel, Technical Applications Manager at Morgan Advanced Materials.

Large dimension PZT blocks are suited to a range of high-integrity applications, such as side scan SONAR, sub bottom profilers and transducers for surveying systems. The 'hard' PZT from which they are made provides excellent sensitivity and permittivity, making it ideal for use in sensing applications requiring a wide bandwidth. Thanks to the cutting-edge pressing and firing techniques employed during manufacture, Morgan's large PZT blocks boast a uniform consistency of electro-mechanical properties throughout each component, and can be ground and lapped to precise limits.

They are available in block form or as diced and filled with specially formulated epoxies for use in 1-3 composites, with a range of metallisation treatments also available. This is in addition to Morgan's existing manufacturing capability for large 'soft' PZT blocks.

Morgan's Electrical Carbon business offers grounding brushes and holders for longer bearing life

June 2015

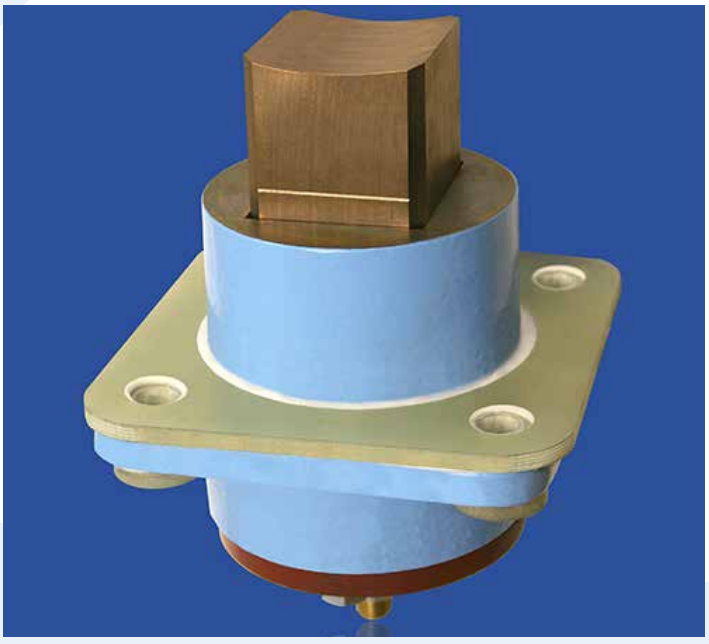
Silver graphite brush and stable holder provide reliable low resistance path to ground

Morgan Advanced Materials' Electrical Carbon business announces the availability of its grounding brush holders, designed for stability and reliable dissipation of current to prolong bearing life. The grounding brush holders have a contact drop of less than 1 volt due to their high quality silver-graphite brush.

DC motors applied on static drive systems and AC motors on adjustable-speed drives can experience voltage spikes that can cause current to flow through the motor shaft bearings. Over time, these currents cause pitting of the bearings and eventually bearing failure.

Introducing grounding brushes to the motor to provide a low resistance path to ground, in parallel with the bearings, can eliminate this issue, without the difficulty of insulating the bearings. Most of the current can be directed through the grounding brush, greatly extending bearing life.

Shaft grounding brushes by Morgan are constructed from silver-graphite, providing extremely low resistance. They are housed in a specially-designed holder that fully supports the brush on both sides, giving it greater stability than that provided by other products on the market. This inexpensive yet reliable device has the potential to greatly lengthen bearing service life in a variety of applications.



Morgan and Loughborough Univeristy collaborate for new generation flow meters

June 2015

Materials engineering company Morgan Advanced Materials has joined forces with a leading research university to investigate the use of alumina blocks in new generation ultrasonic flow meters. Together, Morgan and Loughborough University's Advanced Ceramics Research Group are exploring the potential use of reflective alumina blocks in place of the stainless steel blocks which are currently widely used in these applications.

High performance ultrasonic flow meters have many applications, but in particular they are used in smart meters for utility and industrial flow measurement. Given the roll-out of smart meters worldwide, there is increased demand for accurate, reliable and durable ultrasonic flow meters.

Compared with traditional mechanical flow meters, ultrasonic meters provide greater sensitivity, accuracy and longevity. This is largely due to their use of solid state technology, which means they have no internal moving parts and so suffer no internal wear. That, in turn, means ultrasonic meters retain their accuracy over the long term.

In a fully assembled ultrasonic flow meter, a pair of sensors is mounted in parallel to a flow tube, along with other electronic devices required. The meter calculates the flow rate of a medium, generally a liquid or gas, by assessing the delay in response between the two sensors, which are driven by electricity to create ultrasonic waves.

It is very important that the ultrasonic wave created by one sensor be transmitted to the other sensor with minimal loss. Blocks with an angled reflective surface are used to achieve this. The blocks must retain their reflective surface throughout service, since any loss or degradation of reflection will impair the transmission of the signal between sensors. Traditionally, stainless steel has been used to make such blocks, but as new technologies and possibilities come into view, it is important to investigate their qualities.

Morgan's Technical Ceramics business is a market leader in the manufacture of ultrasonic flow sensors, using a special grade of piezoelectric ceramic, lead zirconate titanate (PZT). This cutting-edge material, combined with Morgan's top class manufacturing and assembly capabilities, produces ultrasonic sensors of exceptional quality. Now, Morgan is putting itself firmly at the forefront of relevant research, in collaboration with the Advanced Ceramics Research Group at Loughborough University.

The Loughborough group, led by Professor Bala Vaidhyanathan, is globally respected and widely acknowledged as one of the leading teams concerned with the understanding and characterisation of technical materials. Together, the two organisations will evaluate the degradation of stainless steel and alumina ceramics, through a test that simulates 20 years of service within a flow tube. The alumina ceramics used in this research are all approved by the Water Regulations Advisory Scheme (WRAS), which approves the materials commonly used in water management applications.

Dr Yifei Zhang of Morgan Advanced Materials believes this research partnership is likely to produce outcomes of significant interest and practical use, not only for Morgan but for many sectors and applications. He commented: "The accurate measurement of volume flow is important in many sectors, but at the moment there is particular interest in smart meters. This growing commercial application fuels demand for highly accurate meters that are cost-effective and durable which require novel materials to be applied in innovative new ways. We are proud to be working with Loughborough University on the type of research that will take technical ceramics – and ultrasonic flow meters – into the future."

Advanced Materials processing enables ultra-fine, detect-free PZT ceramic components from Morgan

June 2015

Morgan Advanced Materials has announced that it now has the capability to manufacture defect-free lead zirconate titanate (PZT) ceramic products in wall thicknesses as low as 50 μm.

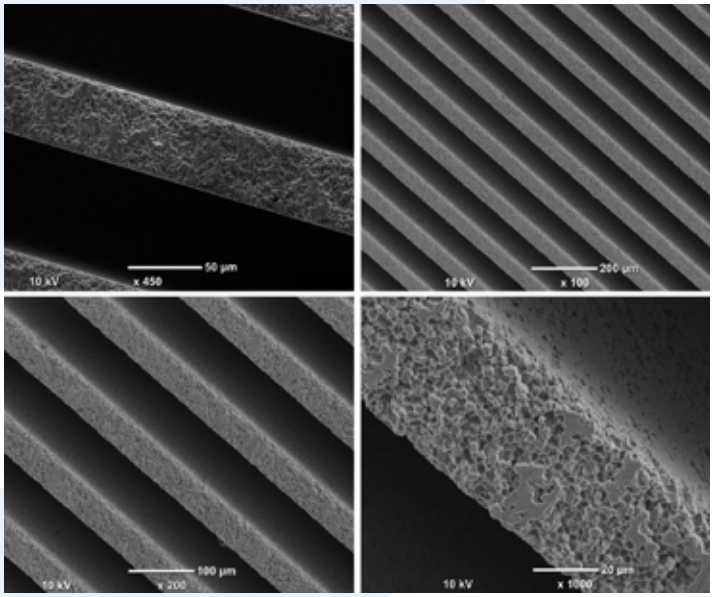
The products are suited to high-precision applications such as next-generation inkjet printer heads and high-frequency ultrasound systems.

The capability has been developed through precise modification of Morgan's material processing to optimise microstructural control, enabling enhanced machinability. Processing improvements result in increased homogeneity and a narrow distribution of particle sizes. With careful control of sintering conditions, it is possible to achieve a reduced grain size and significant increase in densification.

Thanks to their piezoelectric properties, PZT materials are widely used across a range of applications, such as the production and detection of sound, generation of high voltages, and electronic frequency generation.

Jim Bennett of Morgan explained: "The attributes of our PZT materials are proven, but customers are now demanding them in ever smaller and higher-quality packages, in applications where space is at a premium or where performance cannot be compromised. The production of complex architectures and irregular shapes is possible due to our array of machining technologies, choice of electrodes and patterning capabilities.

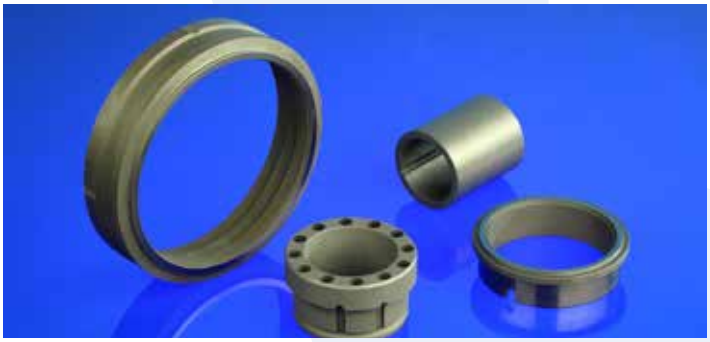
"As well as ink-jet printer heads, we see opportunities for these components in high-frequency ultrasound devices to enable structural health monitoring and ultrasonic motors for micropositioning. We welcome customers to challenge us with their individual application requirements."



Morgan Advanced Materials offers PGS-100 graphite-loaded silicon carbon for demanding oil and gas sealing applications

June 2015

Morgan Advanced Materials' PGS-100 graphite-loaded silicon carbide material is ideal for oil and gas applications that require protection from high temperatures and corrosive environments. Its advanced properties help reduce seal face wear, increasing uptime, and offering up to twice the service length of competitive components. Morgan can custom machine the material into a wide range of geometries for such applications as; refinery seals, industrial abrasive slurry seals, and industrial pump bearings and seals. The material is also ideally suited for sour crude oil pumping at temperatures greater than 700°F



The unique face topography that results from the PGS-100 material enhances seal face pressure-velocity (PV) characteristics compared to monolithic sintered silicon carbide and, unlike monolithic materials that incorporate matte lapping to increase face roughness, the PGS100 topography remains for the life of the product. The material also improves thermal shock tolerance, with the ability to survive and maintain integrity in the face of rapid temperature changes on the order of several hundred degrees. In addition, the material allows users to survive in marginally lubricated conditions for longer than sintered carbide. Providing this window of tolerance enables significant savings to be achieved resulting from increased uptime, and reduced parts and labor costs.

Morgan provides design guidance and assistance selecting the most appropriate material and grade for specific customer applications. With materials finishing capabilities in the US, UK, and China routine parts can be supplied globally within short lead times. Morgan also offers expedited services for emergency replacement circumstances to enable the most rapid recovery of uptime.

Morgan Advanced Materials launches new, lightweight, high-protection Silverback 4020 Elite explosive ordnance disposal suit

June 2015

Morgan Advanced Materials has announced the launch of a new, lightweight explosive ordnance disposal (EOD) suit, the Silverback 4020 Elite suit, from its Composites & Defence Systems business. Combining new technology, cutting edge materials and premium quality garment construction, the suit gives users the highest levels of protection, while allowing them the freedom of movement required to successfully complete EOD tasks.

Key benefits of the Silverback 4020 Elite suit include its innovative quick-release technology, which allows the user to get out of the suit unaided, in less than 20 seconds; while the ergonomics and design of the suit afford the user the freedom of movement to crouch, crawl and climb as required - ideal for when users need to gather forensic evidence.

The suit's helmet is available with either a scratch-resistant heated glass or polycarbonate visor. Combined with a balanced battery pack, the operator benefits from superior vision and enhanced situational awareness even in the most demanding of environments. The suit also features a decoupling breastplate with an innovative three-piece design to optimise flexibility, an integrated back protector that provides blunt trauma protection and delivers cooling air, and a cooling system that fits unobtrusively at the rear of the suit. In short, the Silverback 4020 Elite suit combines operational flexibility with uncompromising levels of safety.

Martyn Cook, Development Director for Morgan's Composites & Defence Systems business, comments on the latest addition to Morgan's highly respected range of protective systems. "The new Silverback 4020 Elite suit offers excellent freedom of movement a genuine advantage in the field, particularly where users need to gather forensic evidence," he explained. "We have taken great care to combine this flexibility with the high levels of quality and protection for which Morgan is quite rightly renowned - we are very proud of this achievement."

Morgan pushes the boundaries with largest ever severe service ball valves

June 2015

Morgan Advanced Materials, after continued research and development in its technical ceramics manufacturing capabilities, now has the capability to manufacture balls up to DN250 in diameter for severe service valves from its acclaimed Nilcra® Zirconia-based material.

Previously, valve balls have only been available in sizes of up to DN150 but the trend in process industries to reduce cost by designing systems with larger pipe diameters which require fewer devices overall has led Morgan to create a capability to manufacture balls in this larger size. The balls are ideal for use with flow control valves operating in industries such as mineral processing, oil & gas, and pulp & paper.

A Zirconia-based material partially stabilised with magnesia, Nilcra® delivers exceptional strength and toughness together with erosion and corrosion resistance and is therefore frequently used in place of conventional materials such as metal alloys to provide longer component lifetimes. The material's properties make it ideal for use with slurries generated in mineral processing as well as abrasive rock particles and sand encountered in oil & gas extraction and processing.

This, and its ability to withstand high actuation torques applied during valve operation, has led to Nilcra® being regularly specified by the world's five largest valve OEMs for more than 25 years. Morgan's Steve Thompson explained: "In recent years there has been increasing demand across multiple sectors to reduce cost by minimising the number of pipes and pipeline devices, while increasing pipe diameters. The diameters of the valves which control flow in these systems has also had to increase. "Flow levels are determined by the square of the pipe diameter, meaning a DN250 system can handle approximately three times the capacity of its DN150 counterpart, typically reducing overall component count by around 65 per cent. We have pushed the boundaries of ceramic processing and can now deliver valve balls in this size, opening up a realm of new possibilities for system designers."

Morgan Advanced Materials announces customized high precision, high sensitivity piezo bimorph components

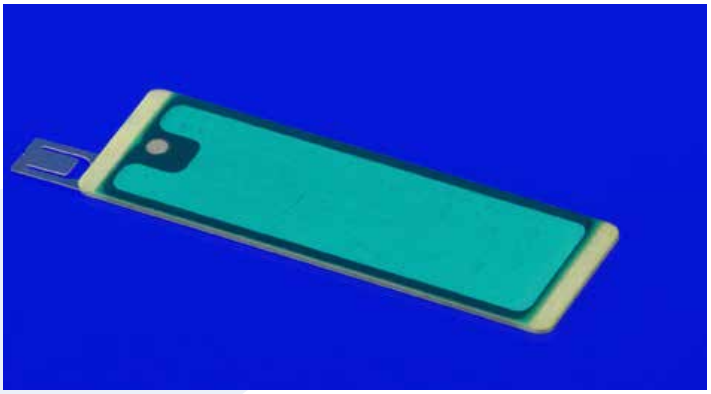
June 2015

Morgan Advanced Materials has industry-leading capabilities to develop high precision piezo bimorph components. With a 45-year history of piezo bimorph manufacture, Morgan specializes in working closely with customers to develop customized solutions. Morgan's superior piezo bimorphs are widely used in energy harvesting devices, enabling the efficient conversion of mechanical energy to electrical energy. Other uses include; pneumatic valves for industrial and automotive applications, valves in medical equipment, insulin pumps, and Braille keys, as well as textile machinery and optical switches.

Available in carbon fiber or metal reinforced versions, the piezo bimorphs range in size from 6 to 74 mm long (0.23 to 2.91") and 1 to 43 mm (0.04 to 1.69") wide with the capability for both series, and parallel bimorphs to be developed. The high sensitivity and cost efficient piezo bimorphs feature a high force/deflection ratio and an extremely long lifetime. A wide selection of piezoelectric materials are available, offering high d31 and coupling coefficients to maximize the signal to noise ratio responses in sensor applications, and enhance the displacement characteristics when used as an actuator device.

Morgan also manufactures and designs co-fired lead zirconium titanate (PZT) bimorph elements. These elements are two-layer PZT devices configured with a central encapsulated electrode region. More mechanically stable than those with conventional bonded bimorph, the co-fired PZT bimorph elements are ideal for oil exploration and machine and equipment monitoring applications, as well as for automotive engines, feedback sensors, and high temperature accelerometers.

With its extensive advanced materials knowledge, Morgan provides an unrivalled range of materials by producing specific formulations from raw materials that can be customized to specific requirements. In addition, advanced computer modelling techniques are used throughout the development of new designs, enabling a faster, more efficient product development process. Morgan's piezo bimorph manufacturing sites are ISO 9001 accredited and ISO 13485 certified for the production of products for medical applications.



Morgan and Tyr Tactical announce armor system passes NIJ Level III certification testing requirements

Morgan Advanced Materials hard armor, in-conjunction with Tyr Tactical's soft armor system, has successfully passed the ballistic, durability, and environmental requirements of the NIJ 0101.06 Level III certification process. Full NIJ certification is pending, with completion expected this summer. With a 10-inch x 12-inch plate weighing 2 pounds and just over ¾-inch thick, the modular and scalable system provides substantial weight and thickness advantages over stand-alone plates.

The system consists of a Lightweight Buoyant LWBIII+ rifle plate developed by Morgan's Composites and Defence Systems business with Tyr Tactical's T52/SP or T54/C soft armor. In addition to the NIJ Level III threat, the Level III+ system is capable of stopping a variety of rifle threats, including 7.62 millimeter (mm) ball rounds, 7.62mm mild steel core (AK47) rounds and 5.56mm ball rounds (M193 and LE223T3).

The ultra-lightweight, high performance hard plate insert which is manufactured from the latest generation durable composite technology is extremely hard wearing and designed specifically for the rugged environments faced by military and security personnel. The products are available to law enforcement, security, and military/defense customers.

Morgan Advanced Materials announces robust brazed assemblies for medical imaging applications

June 2015

Morgan Advanced Materials announces the availability of brazed assemblies for medical imaging applications using ceramic insulators. Assemblies are manufactured with proprietary grades of high purity alumina ceramic with superior electrical and dimensional stability across a wide temperature range. Morgan's ceramic-to-metal assemblies for imaging components include high voltage insulators for CT scanning equipment, anodes and cathodes, filament insulators, getters and headers, as well as ceramic components used in vacuum tubes for x-ray equipment. Morgan's materials and manufacturing process result in better seals with maximum hermeticity for high performance and extended life cycle. Advanced ceramics also allow higher voltages, which result in higher power and improved image resolution.

By producing components in a vertically-integrated manufacturing process, Morgan controls process, quality and cost. Along with Morgan's materials expertise, they offer in-house powder preparation, ceramic forming, ceramic sintering, metallization, electroplating, assembly, and brazing. Inspection, testing and cleaning processes dedicated to imaging components are also available. By controlling every aspect of the manufacturing process Morgan ensures that all customer components are fully tested and certified, and meet all material traceability requirements. Use of rapid prototyping and machining capabilities reduces tooling requirements, which reduces lead times by as much as 50 percent.

Products made from Morgan's high purity alumina grades are far stronger and more durable than those that use glass as an insulator. They offer higher strength and better electrical characteristics making them highly suitable for the high voltages used in power tubes. They are also better able to withstand rotational forces to which the imaging tube is subjected.

Brazing ceramic to metal results in a reliable hermetic seal – hermetic to less than 10(-9) atm cc/sec He. The materials can also be lapped to very tight tolerances and can be produced using isostatic or dry pressing, and can be manufactured in prototype, batch or volume production.

Morgan PZT Materials shine in deep sea tests

June 2015

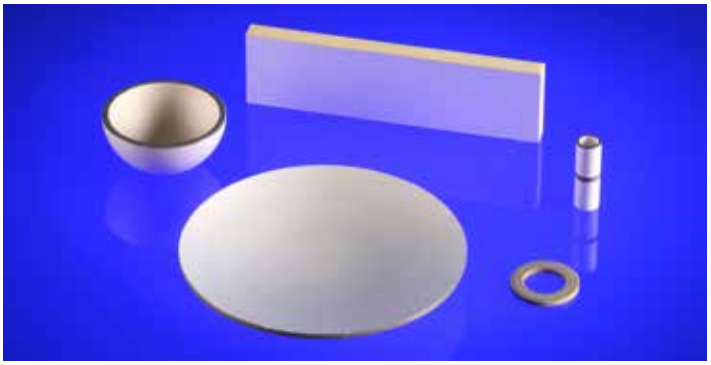
Test carried out by Morgan Advanced Materials on its proprietary range of Lead zirconium titanate (PZT) materials for deep sea applications are proving they can withstand pressures greater than any they are likely to encounter in deep sea use with no loss of performance.

The tests involve a variety of ceramic formulations typically used in underwater applications, including both 'soft' and 'hard' PZT types. The objective was to better understand the behaviour of the materials and any changes in their electrical properties after tens or hundreds of exposures to very high pressures.

A pressure of 27,000 psi (1,862 bar) was applied to each ceramic type - equivalent to a depth of 18,500 m underwater. This is beyond the maximum known deepest point in the ocean – the Mariana Trench, which at a depth of 10,994 m (± 40 m) exerts a pressure of 15,750 psi (1,086 bar), more than 1000 times the standard atmospheric pressure at sea level.

Results showed that Morgan's PZT5A1 'soft' and PZT401 'hard' formulations suffered no signs of depolarisation at this pressure. Depolarisation has always been a concern for transducer design engineers, in the selection process of ceramic materials for deep sea applications and the traditional preference has been to use a 'hard' based ceramic material. However, these results confirm that a 'soft' product can now be specified delivering equal performance.

Paul Turnbull of Morgan explained: "The ability to withstand multiple pressure cycles is key to guaranteeing the long-performance of PZT materials for use in deep water applications. Our tests, comfortably exceeding any pressures materials are likely to face, saw our materials excel in extreme conditions, providing further reassurance for specifiers and customers of our ability to meet the most demanding performance parameters."



Morgan
Advanced Materials

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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