Custom design & moulding of elastomeric components

Issue 1.1
James Walker is a dynamic global manufacturing organisation and has been at the forefront of materials science and engineering for over 130 years.

This brochure offers an insight into the development of new or customer specific products and the services we can offer in material formulation and compounding, component design and re-engineering plus manufacture and supply.

The custom design and manufacture of elastomeric and composite components is only a part of the elastomer manufacturing activity carried out by James Walker. For a comprehensive picture of our business, this publication links together with a range of brochures covering our offerings for specific industries or individual product ranges such as ‘O’ rings or hydraulic seals.

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Continual development
Our materials science, engineering and production processes are constantly evolving and if developments in any of these areas can improve a product’s performance, our customer will be the first to know.

Manufacturing
A product is not an effective solution if it cannot be successfully and economically manufactured. With the complete concept to delivery process covered in-house, James Walker design engineers are able to ‘design for manufacture’ from the very beginning of a project.

Testing
Our extensive in-house test facilities for both materials and finished product testing help provide rapid feedback on prototype validation. Many of our test facilities have been built to service specific customer projects.

Applications engineering
The James Walker applications and product engineering teams hold a wealth of experience across a broad range of industrial sectors. They’ve seen most problems before and know where to start.

Product design
Our award-winning product development process includes industry-specific teams working on customer projects and our own developments to advance the application of elastomer technology in the key industrial markets served by our business.

Materials knowledge
We formulate and compound our own material, which means that we can modify existing elastomer compounds or create new variants to suit the demands of individual customer projects.

Critical applications expertise
James Walker specialises in the design and manufacture of products and engineering solutions for complex or critical applications.

We produce added-value solutions and are not involved in the high volume production of low quality commercial mouldings.

Partnership
Our aims are your aims – to improve process reliability and performance, reduce costs and provide a competitive advantage.

An extension of your resources
Think of James Walker as an extension of your own resources and tap into over 130 years of engineering and materials science knowledge and expertise.

Total in-house capability
We have the facilities, the people, the knowledge and the financial weight to carry the full concept to finished product process in-house. This simplifies communication and streamlines the whole product development process.

Confidentiality
Engineering for critical applications or to provide customers with competitive advantage through leading-edge technology – the trust and confidentiality of our customer relationship is at the heart of everything we do.

Adding value to your business
Why James Walker?
Our focus is on offering differentiation through performance products and systems which utilise our advanced materials technology and engineering competencies.

Whilst a few of our competitors may be able to match our facilities – and it is a very few – none can match our people, their expertise, knowledge and experience. It is these people that will add the value your business is seeking.

A trusted partner in solution design and engineering

For further details, call your local contact shown on rear cover or listed at www.jameswalker.biz
Manufacturing capability
From a single small moulding to a large diameter seal, James Walker has the experienced workforce and flexibility of production to be able to facilitate rapid prototype turnaround and productionisation of final designs.
Our capabilities include multi-material bonding, clean room manufacture, one-piece moulding of components up to 2.25m diameter plus a continuity moulding process that offers components of infinite length and diameter.
Following the moulding process we can carry out further machining operations or build our components into sub-assemblies to customer specification.

Productionisation
With a capability for extrusion, injection, transfer and compression moulding plus in-house tool manufacture and years of experience in working with elastomer compounds of all types, our production management and quality control teams will prepare a detailed production process with all the necessary quality and specification checks to ISO 9001: AS/EN 9100 accreditation.
Where necessary, processes and documentation will be created to match more stringent industry or customer requirements.

Delivery
Manufacture and delivery of the first batch is by no means the end of the story.
Our materials science, design engineering and product processes are constantly evolving and if developments in any of these areas can improve a product’s performance, our customer will be the first to know.

Evaluation
We begin with a detailed evaluation of the physical environment in which the component will operate before assessing its desired performance and longevity.
We then confirm the commercial viability of achieving these criteria both for James Walker and our client.

Design
Years of experience and expertise aided by the latest FEA modelling and 3D CAD packages ensure that our design engineers generate effective solutions within a realistic timescale, forming an engineering partnership with our customers’ own engineering and design teams.
The design phase may also include recommendations on the re-engineering of associated elements in order to improve overall performance and reduce manufacturing or maintenance costs.

Materials
Taking into account the proposed physical environment, performance and life expectation requirements along with the initial component design, James Walker’s material scientists are able to test a range of the most suitable materials to determine the best possible choice.
If necessary the team has the expertise and in-house capabilities to adjust formulations or ultimately formulate new compounds in order to optimise the material selection.

Prototype
With in-house pilot mixing plant facilities and our own tool manufacturing cell, we can easily and quickly manufacture prototype components for performance evaluation and design verification trials.

Testing
Our extensive in-house test facilities for both materials and finished product testing help provide rapid feedback on prototype validation.
Testing can be third party witnessed or witnessed by our customers and once the prototype hits the required performance criteria we manufacture further samples for live application testing.

Proposal
The initial component design and material choice will now be presented to our customer in a fully costed proposal.
This allows our customer to accurately assess the commercial viability of the solution before the process moves on to prototyping and testing.
Total in-house capability

Unlike many manufacturers of elastomer components, James Walker has the capability to formulate and compound elastomers in-house. Rather than purchase compounds from the open market, James Walker develops and adjusts formulations to improve performance, tuning materials for the application in which they are required to perform.

This capability also provides total traceability and control over material quality from finished product right back to the raw ingredients for the original material batch.

Vermilion®, FR® and Elast-O-Lion®
Rapid gas decompression resistant materials

From the development of the first rapid gas decompression (RGD) resistant elastomers to the latest New Generation products, James Walker has led this area of material technology for more than 30 years.

Because our design engineers and material scientists understand the environments in which our products are required to perform, James Walker elastomers are not formulated purely for RGD resistance. We understand that factors such as temperature and media are often equally as important, so our materials are designed to offer excellent RGD resistance without compromising on performance in these other areas.

Ultraglide
Low friction material

Developed to meet demands from the metallurgical industry, Ultraglide offers an extended working life for radial lip seals when running for long periods under hot and abrasive conditions.

These features have also seen this material succeed in other industries including marine propulsion and Ultraglide has now become part of a range of similar modified materials offering reduced friction and extended life in higher speed applications.

Shieldseal®
Materials for nuclear applications

Shieldseal materials are James Walker’s proprietary materials specifically designed to resist ionising radiation. Their change in physical properties has been monitored over time with gamma radiation to prove compression-set resistance and long service life.

In addition to our own compounds and materials that we have developed for customers, James Walker has a long history of expertise in processing industry standard materials and customer specific materials such as EPDM 30H.

Elast-O-Pure®
Biopharmaceutical grade materials

Elast-O-Pure® is our range of elastomer materials developed specifically for the biopharmaceutical sector — unlike the majority of products available, which are based on materials adapted from the less rigorous regimes of food and drink applications.

The Elast-O-Pure range of materials offers the lowest levels of leachables and extractables by a large margin and provides enhanced performance in operation with no compromise on any physical capability.

Each material and its constituent ingredients are FDA compliant and USP Class VI certified with every element fully traceable.

James Walker works in partnership with industry to formulate materials for specific application duties.

These compounds are just a taste of our specialist materials ranges. For full details scan the QR code to download the James Walker Elastomer Engineering Guide.
Material testing

James Walker’s investment in both people and equipment places us in a position few can match. Most importantly, the people behind these facilities possess the experience and expertise to leverage the maximum benefit from the resources for James Walker customers.

Batch testing

Every batch of material produced is placed in quarantine and subjected to a panel of tests prior to being used for product manufacture. The standard test regime for each batch includes:

- Cure characteristics
- Hardness
- Density

Laboratory facilities

Comprehensive in-house analytical laboratory facilities and the expertise to run such a facility is essential in fulfilling the demands of custom projects and ensuring quality standards are maintained.

Material testing

In addition to batch and specification testing, we also test finished products to ensure that the compound remains true to specification. Further to this we also have the capability to test the effects of application and environmental conditions including:

- Environmental chamber -75°C to +185°C
- RGD testing to levels exceeding Norsok M710 Annex B
- Steam testing of clamp seals and diaphragms
- Rotary and reciprocating test rigs for dynamic testing
- High pressure testing

Raw materials

Our supply chain is very strictly controlled, with all our raw materials coming from fully audited and certified sources. Nevertheless, all incoming batches are checked against specification to ensure full traceability and eliminate any risk of variation in our elastomer compounds.

Specification testing

In addition to standard QA checks, further tests against specific industry or customer material specifications are conducted as required. Materials must pass these tests before being released into production.

These tests include:

- Tensile strength
- Compression set
- Low temperature flexibility
- Elongation at break
- Fluid resistance
- Modulus
- Environmental chamber -75°C to +185°C
- RGD testing to levels exceeding Norsok M710 Annex B
- Steam testing of clamp seals and diaphragms
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- High pressure testing

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Elastomer performance in hydrogen sulphide

Technological enquiries sent to seal manufacturers often include requests for test data which substantiate their claims, and it is in the interest of both parties that such claims are realistic. Short-term test programmes will never fully predict long-term performance though in many cases, for reasons of cost and time constraints, there is no practical alternative.

Any form of testing is a part of the risk management process, and this paper describes a sour gas test programme where the risk has been at least partially mitigated through careful experimental design and detailed investigation of the reactive chemistries involved.

Leading research papers

The James Walker material science team is highly regarded within the elastomer science community and has been responsible for publishing a number of important technical papers.

These papers cover key performance criteria and elastomer behaviour in a number of the extreme environments faced by our customers. A sample of recent topics are outlined on these pages and more papers are available to download from the James Walker website.

Engineering elastomers for RGD performance

James Walker has published a number of technical papers in this area including the development of the next generation of materials and a critique of various industry criteria used to assess a material’s suitability for use under RGD conditions.

Elastomers for biopharm uses

EPDM elastomers have gained a bad reputation within some areas of the biopharmaceutical sector and the James Walker research demonstrates that the key to performance is not a USP Class VI approval but is down to the quality of the basic ingredients within the formula and making sure that corners are not cut in the compounding process.

Elastomers at low temperatures

The physical properties and behaviour of elastomers change significantly as temperatures drop, but many manufacturers continue to make wild performance claims.

The James Walker technical paper examines the reactions of elastomers to extreme cold and takes into consideration a range of other factors that may also be influencing behaviour in an attempt to clarify performance claims.

Material research & development
No substitute for experience

The latest software and computing power are only tools – it is the years of expertise in engineering with elastomers brought to the table by James Walker’s design and applications engineering teams that makes the difference.

Experience in working with elastomers, a detailed appreciation of their limits and capabilities plus the real-world applications experience that comes only from having completed thousands of projects across virtually every industrial sector – that is what James Walker customers are tapping into.

Working in partnership

Think of us less as a solutions provider and more as an extension of your own engineering department. When you engage James Walker on a design and engineering project, we expect you to treat us like your own people. After all, we are working towards the same end and by integrating our physical and human resources we can get there so much faster.

...our customers consider James Walker as a specialised extension to their own design and engineering departments.

Confidentiality guaranteed

As much of our work involves finding solutions to operational problems or developing products that will provide our customers with a competitive advantage, strict confidentiality and non-disclosure agreements are the order of the day.

Sadly this limits our opportunities to tell the world of our success, suffice to say that behind every example shown in this brochure there are hundreds more highly successful projects and satisfied clients.

Design

From sealing cartridges in marine propulsion applications to downhole drilling components for the oil industry and diaphragm units on biotech plant, our design engineers have developed new concepts to improve performance, longevity and reliability.

The use of the latest CAD systems allows our teams to interface directly with customer departments or multiple project partners ensuring that all elements of a design are perfectly co-ordinated and that projects are efficiently managed.

Computer modelling

For proofing of design concepts and problem analysis we use FEA modelling wherever possible. This provides the necessary ‘sense-check’ and confidence that the correct route is being followed for all parties involved – critical when large financial or time commitments are being made.

...modelling, testing and prototyping can all be carried out in-house, maximising project efficiency.

Re-engineering

Our elastomeric components don’t work in isolation – their interaction with housings, shafts and other components is critical to overall performance. The solution may therefore often lie in changes that can be made to other components and it is here that James Walker’s experience comes to the fore. Major improvements in performance and reliability are often achieved through minor re-engineering suggestions from our design teams.

Optimising cost of ownership

Having the ‘right tool for the job’ is not an exercise in cost – it is simply the most efficient way of working. James Walker custom engineered components are tailored to a specific application to provide the best value solution in terms of reliability, longevity, performance and maintenance requirements. This ensures our customers optimise their cost of ownership not just for the component we supply, but also for the critical process or application in which our custom component is a working part.
Tool design & manufacture

Our in-house tool design and manufacturing division provides a rapid response and total flexibility when creating the necessary tooling for production or prototyping.

This in-house capability also provides peace of mind for our customers with regard to their intellectual property when we produce bespoke components to confidential designs.

Clean room manufacturing

We operate two ISO Class 7 / Class 10,000 clean manufacturing cells covering the manufacture of components for the pharmaceutical, nuclear and semi-conductor industries.

One cell is dedicated specifically to silicone and white elastomer materials and all operations, including inspection and packing are carried out within the controlled clean environment.

Material bonding

Our intimate knowledge of materials science enables us to engineer solutions using a diverse range of elastomer-based bonded composites.

We bond all standard elastomers, including high-performance grades, to a variety of materials – achieving intimate bonds of very high strength.

Today, many of the components we now regard as ‘standards’, such as end cap seals for the oil and gas industry, involve the successful bonding of metal and elastomer.

Our success in these techniques is the result of many years of process experimentation and development. This expertise is now fully integrated within our manufacturing process at a quality level unmatched by our competitors.

Our expertise includes the manufacture of bonded components involving:
- Elastomer – Metal bonding
- Elastomer – Engineering plastics bonding
- Elastomer – Elastomer bonding
- Elastomer – Fabric bonding

All processes undertaken within the clean manufacturing environment are fully audited and are an integral part of the manufacturing and materials traceability we offer to our customers.

Our clean manufacturing facilities have been audited and commended by leading global players in both the pharmaceutical and nuclear industries.
Perfection as a starting point

From the highly experienced eye of a press operator to the examination skills of manual inspection or the electronic scrutiny of the latest automated inspection machinery, the James Walker philosophy is the same at every point of the production process – ‘Zero defects’.

When designing and manufacturing bespoke components for critical applications only perfection is acceptable because we know that the business, environmental and potentially human cost of failure in operation is too great.

Accreditations

James Walker materials, products, design, manufacturing and administration processes conform to the highest industry standards and satisfy the requirements of key global businesses from every industrial sector, including Oil & Gas, Nuclear, Biopharmaceutical, Marine, Aerospace & Defence.

API
Norsok M-710
Shell
Total
ISO 9001
AS/EN 9100
BAE Systems
Rolls Royce
Ministry of Defence
GlaxoSmithKline
ASME-BPE
FDA
USP Class VI

Product quality control

The first product of each batch is checked against job specification to ensure no tooling or processing defects have occurred. Once this is approved, the remaining production run goes ahead.

Each and every finished product is then individually inspected either by hand or automated inspection machinery. Products may also be subjected to additional testing at customer request.

Destructive testing of representative samples can also be carried out (including compression set and immersion testing) as further checks that the finished product retains the desired characteristics of the chosen material from which it has been manufactured.

Material quality control

All raw materials are vetted against required specification before anything enters the compounding process to ensure the consistent performance of each compound formula is not compromised.

Each batch of mixed compound is then quarantined before being allowed through into the product manufacturing process until a minimum of density (BS ISO 2781), weight, hardness (BS ISO 48) and cure characteristics have been tested and checked against the performance specifications of that particular material.

Our in-house analytical laboratories also undertake a range of additional tests to fully assess the mechanical and chemical properties of materials including:

- Tensile strength – BS ISO 37
- Elongation at break – BS ISO 37
- Modulus – BS ISO 37
- Fluid resistance – BS ISO 1817
- Air ageing – BS ISO 188
- Tear Strength – BS ISO 34-1 & -2
- Thermogravimetric analysis
- Chemical compatibility
- Infrared spectroscopy
- Torsion modulus – BS ISO 1432
- Temperature retraction – BS ISO 2921
- Abrasion resistance
- Ozone, weathering and UV resistance testing
- Compression set - BS ISO 815
- Tg glass transition
- Differential scanning calorimetry
Rotary & reciprocating motion

Today’s computer simulations and material behaviour predictions from laboratory testing are highly accurate but nothing beats a live mechanical test.

- Rotary seals at up to 405mm shaft diameter, 30m/s and 25bar pressure
- Reciprocating seals at up to 5m/s and 420bar pressure

It is the results from hours of application testing that provide the real ‘peace of mind’ for James Walker customers. Better to explore the limits of critical components on one of our rigs than in a live application.

Bespoke test rigs

Faced with new applications and new problems James Walker has designed and built test rigs that allow real-world conditions to be replicated in order to monitor component behaviour.

One key example is our water turbine / marine propulsion rig, which allows us to run a vast range of shaft speeds, shaft materials, seal types and pressures as well as trialling different lubricants and operating temperatures.

Environmental chamber

Our environmental chamber is capable of replicating conditions from -75°C to +185°C.

This facility has helped develop a more detailed understanding of how elastomeric components behave as temperature changes rather than relying on standard calculation and extrapolation based on laboratory material testing.

Diaphragm testing

Built as part of a specific new product development programme, our latest rig allows up to 12 diaphragms to be tested simultaneously.

Capable of accommodating valves from any OEM at sizes from 1/2” up to 2”, the system is used for performance benchmarking, proof of concept and material testing.

Pharmaceutical regimes

The cleaning regimes employed by the pharmaceutical, food and drink industries are notoriously hard on components.

James Walker has designed and built a rig to test clamp gaskets, valve seals and diaphragms under steam, chemical and water cleaning regimes.

The rig can cycle through up to three media options whilst automatically actuating valves and diaphragms.

RGD testing

James Walker possesses one of the most advanced facilities in the world for rapid gas decompression testing.

Capable of testing at pressures and decompression rates far greater than those required by international standards, this facility is just one of the reasons that James Walker continues to lead the way in the development of RGD resistant elastomers.
Metal to rubber bonding
Our metal end cap seals are hybrid metal/elastomer products with a high level of the extrusion resistance necessary for high pressure casing and tubing application.

We have a long history of successfully designing these seals for ISO 10423 F.1.11 (pressure and thermal cycling) accreditation.

Our metal end cap seals are often custom designed and manufactured to suit specific wellhead sealing environments. They are also available in a range of sections, sizes and materials.

Custom capability
James Walker’s manufacturing flexibility and extensive experience in the processing of elastomers often means that we can find a way to manufacture successful, high-performance products where others fail.

The following pages highlight just a few examples of our capabilities from the broad range of applications and industries we service.

For over 30 years James Walker has led the development of elastomers for oil and gas applications. Today our extensive research on rapid gas decompression in carbon dioxide and screening of compounds in high levels of hydrogen sulphide provides the in-depth understanding driving the performance advances of our next generation compounds.

More than meeting industry standards, our material choice – coupled with the fact that we carry out compounding in-house – means that material options can be tailored to meet specific application requirements.

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The vast majority of products we manufacture for the oil and gas industry are proprietary technology, providing specific benefits to individual customers and so remain confidential and cannot be discussed or revealed in any way – suffice to say that James Walker’s global reputation in elastomer technology makes us the first port of call for end-users and equipment OEMs involved in both sub-sea and land-based production and exploration.
James Walker Elast-O-Pure® materials are specifically formulated to USP Class VI for biopharmaceutical applications and offer a range of key benefits:

- Seamless pipe transition
- Very low compression set – ideal for long-term retention of sealing forces
- Excellent release properties even after thermal cycling
- Exceptional autoclave and SIP performance
- Resistant to SIP sterilisation systems – very low swell
- Minimal loss of mechanical properties after repeated steam cycling
- Resistant to strong cleaning agents used in CIP systems

Total traceability

For over 30 years we have applied our expertise in specialised elastomers to the biopharmaceutical industries and invested heavily in manufacturing technology and manpower to meet the requirements of this demanding sector.

Our ISO Class 7 / Class 10,000 clean manufacturing and inspection facilities are just one element of our strict quality regime that provides total traceability of product, process and ingredients – giving our customers total peace of mind.

Pressure vessel seals

Critical pressure vessels from our biopharmaceutical customers are often used to contain and transport final product – a single vessel often containing product worth millions of pounds.

James Walker was commissioned to create an effective seal design for the vessel lid and successfully develop the seal in a suitable USP Class VI elastomer material.

Even after the thermal cycling involved in autoclaving and having maintained a seal under pressure for over 5,000 hours, the Elast-O-Pure EP75 seal could be easily removed with no sticking or damage after the test.

This is a perfect example of James Walker’s capabilities in seal design, materials development and accurate application simulation testing, providing a superior product and offering the customer total peace of mind that they are buying a proven solution.

Testing of existing silicone gaskets showed a continual pressure loss at a steady rate over the trial period.

A combination of ingenious seal design and a switch to James Walker’s Elast-O-Pure EP75 EPDM material created a seal that could withstand autoclaving and cooling with no loss of seal integrity.

Tested against the silicone gasket under the same conditions, the James Walker Elast-O-Pure EP75 product demonstrated a rapid energising of the seal followed by maintenance of a steady pressure.

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The precision with which each clamp gasket is moulded eliminates the issue of seal intrusion or recess for the plant operator.

Seal intrusion / recess increases the risks of contamination from particles of exposed gasket shearing off. It also compromises system cleaning as material collects in recesses or on the downstream side of intruding seals.

Such issues carry a high cost to the end user and are common problems for biopharmaceutical plants.
Shieldseal®
Shieldseal materials are James Walker’s proprietary materials specifically designed for use in critical sealing applications within the nuclear industry, where they provide excellent resistance to ionising radiation and a long operational life.

Critical applications
James Walker’s work in the nuclear industry provides an excellent example of the breadth of involvement the company has in developing solutions for its customers.

From investment in clean-room manufacturing to the development of radiation resistant materials and seal or component design – James Walker’s work for the nuclear sector provides the ultimate definition of ‘custom design and manufacture’.

Our Shieldseal® 600 radiation resistant elastomers have been evaluated for resistance to ionising radiation by monitoring changes in important physical properties over time while irradiated with gamma radiation.

This family of fully developed, tested and industry-proven materials provides:
- Excellent compression set resistance
- Resistance to high levels of radiation
- Long service life
- Excellent value for money.

Flask seals
There are now numerous designs of flasks and containers in use worldwide for the transportation and storage of nuclear fuels, as well as the high, medium and low-level wastes resulting from decommissioning programmes.

When considering sealing products for such duties, safety is the paramount requirement, followed closely by reliability and longevity under specific environmental conditions — especially for waste storage.

Inflatable seals
These are also custom-designed and manufactured to meet the stated specifications. They are typically used as seals on personnel locks and hatches. Typical custom products include large rectangular inflatable seals with round moulded corners.

Activated by pressurised gas or liquid, these hollow-centred seals have their inflation valves securely moulded in situ.

Nuclear Working in partnership
James Walker has been involved in the custom design and manufacture of elastomeric sealing products for the transportation and storage of radioactive materials since the 1970s.

Pool/pond & dam gate seals
These are custom-designed and manufactured to meet the required specifications. Features such as moulded corners and a single join are readily accommodated.

James Walker has been involved in the custom design and manufacture of elastomeric sealing products for the transportation and storage of radioactive materials since the 1970s.
Extreme conditions
From extremes of temperature and pressure to hazardous media and radiation, James Walker research and development seeks to extend the boundaries of elastomer performance.
We have developed test regimes and protocols that now lead the way in radiation resistance testing, Rapid Gas Decompression investigation and the testing of ageing in H₂S / sour media.

Large section / diameter seals
James Walker’s capabilities in large section / large diameter moulding of elastomers are perfectly demonstrated by products such as the ‘D’ seals fitted to the large inlet valves on hydropower turbines.
Installed as special shut-off valves for high pressures at the end of the penstock in front of the turbine, the main purpose of these valves is to shut-off the penstock during normal shutdown or in the case of turbine trips.

Adaptability
Valves are one of the most ubiquitous process components, operating under a hugely varied range of conditions and carrying every possible media from the purest of pharmaceutical compounds to the most corrosive of chemicals.
James Walker formulates, produces and moulds elastomer compounds capable of operating at the highest levels under all these conditions, customising material performance to the specific requirements of each application.

A series of technical papers is available covering the latest James Walker developments in key areas of elastomer performance:
• Extractables & Leachables
• Achieving RGD resistance to meet current oilfield needs
• Low temperature sealing capability of ‘O’ rings

RGD resistant ‘O’ rings
James Walker ‘O’ rings in RGD (rapid gas decompression) resistant FR25/90 fluoroelastomer are specified in valves manufactured by AMPO for a major undersea gas pipeline designed to supply Algerian natural gas to mainland Europe from North Africa.
The Medgaz project’s 24-inch pipeline runs for 210km beneath the Mediterranean in a maximum sea depth of 2160m, which means that RGD resistance is a prime consideration for any seals in the system.
Certification of FR25/90 to Total GS PVV 142 (now GS EP PVV Rev 08) by French test house Cetim confirmed the material’s suitability.
Trusted to perform

Our research, design and manufacturing capabilities are trusted by military equipment manufacturers and maintenance contractors around the globe.

Certified to AS/EN 9100 and ISO 9001 and audited and certified by a wide range of OEMs, James Walker components are at work on military vehicles, surface vessels, and submarines plus both military and commercial aircraft.

Safety critical systems

James Walker ‘O’ rings and custom moulded components are specified for a wide range of critical applications throughout the aerospace and defence industries.

Intensive testing of materials and products during the manufacturing process ensures the highest possible quality and precision, but this is only half the story.

Precision moulding

Custom moulding is sometimes simply a matter of extreme precision. In moulding seals for aero engine inspection plugs it is critical that the product is moulded to a fine tolerance that allows the inspection plug to engage in its bayonet housing but still provide an effective tight seal in the engine casing, whilst resisting significant vibration and thermal changes during operation.

Hatch and torpedo tube seals

From propulsion, steering and stabilizing system seals to ‘one-off’ specials on older vessels or hatch and torpedo tube seals for the latest generation of submarines, James Walker products are specified for a wide variety of duties on naval and merchant vessels around the world.

Our custom design and manufacturing capabilities, approved materials and ability to produce components within very short lead times, as well as the provision of on-site and at-sea technical support, are key elements of our reputation as a trusted supplier to the world’s armed forces and military hardware OEMs.

Coffer dam

A sealing system designed and manufactured by James Walker permits maintenance work to be carried out on vessels without the need to drydock.

The specially designed seals are fitted to a coffer dam and seal against the side of the vessel. Once the seal is energised, the water can be pumped out of the area and work can be carried out.

Our products may sit dormant within a system such as an ejector seat mechanism for years but must perform perfectly when called upon, to ensure the correct deployment of the seat/parachutes and the seat life support systems.

With lives at stake, the correct material selection — such as James Walker’s world-leading rapid gas decompression resistant elastomer grades — is absolutely paramount and we are one of a very small number of companies with the capability to formulate, manufacture and test these high performance material grades.

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Intensive testing of materials and products during the manufacturing process ensures the highest possible quality and precision, but this is only half the story.

Custom moulding is sometimes simply a matter of extreme precision. In moulding seals for aero engine inspection plugs it is critical that the product is moulded to a fine tolerance that allows the inspection plug to engage in its bayonet housing but still provide an effective tight seal in the engine casing, whilst resisting significant vibration and thermal changes during operation.

A sealing system designed and manufactured by James Walker permits maintenance work to be carried out on vessels without the need to drydock.

The specially designed seals are fitted to a coffer dam and seal against the side of the vessel. Once the seal is energised, the water can be pumped out of the area and work can be carried out.

Our products may sit dormant within a system such as an ejector seat mechanism for years but must perform perfectly when called upon, to ensure the correct deployment of the seat/parachutes and the seat life support systems.

With lives at stake, the correct material selection — such as James Walker’s world-leading rapid gas decompression resistant elastomer grades — is absolutely paramount and we are one of a very small number of companies with the capability to formulate, manufacture and test these high performance material grades.
Manifold seals
Each cylinder on one of the world’s most powerful and efficient marine diesel engines has two inlet seals – one for the ozoniferous air charge – the other for water/glycol coolant.

James Walker design engineers were involved from the very start of investigations into why existing seals were not operating correctly and soon discovered that the steel spring anti-extrusion elements of the original seals were pushing into the face of the aluminium-alloy manifold and creating leakage paths.

Continual innovation
We are strong believers that any solution – no matter how good it is at the time – can and should evolve.

To this end we constantly seek to improve the performance of our designs and materials as well as our manufacturing processes in order to advance both our production capability and the performance of our products.

This led to a complete seal redesign with a horizontal U-ring profile that would work without the problematical spring reinforcement. We also redesigned the seal housings to work more efficiently within the engine assembly tolerances.

A suitable James Walker elastomer – resistant to ozone, glycol and heavy fuel was used for the seal manufacture and two design variants were created — one for retrofitting to existing engines, and the other for use with the redesigned housings on new engines.

Innovative products
James Walker pioneered and patented what remains the most effective and simple method for on-site joining of rotary seals more than 20 years ago.

Walkersele® OSJ enables a rotary lip seal to be fitted with the ease and maintenance economies of a split type – yet at the same time provides the high-integrity sealing performance of an endless seal.

Requiring no specialised tools or knowledge to install, it is the preferred method of seal replacement in applications such as marine propulsion, wind turbines, gearboxes and mainshaft sealing where it is beneficial to avoid the requirement for a total stripdown in order to replace a shaft seal.

Walkersele OSJ has provided huge benefits in reducing man-hours and maintenance costs since its introduction. Since its launch, we have continued to further develop and refine both the method of joining and our methods of production in order to make on-site joining easier and product supply faster than ever before.

Large diameter / section components
James Walker is one of a very limited number of manufacturers capable of producing seals and components at large diameters and sections. We have invested in the technology and handling procedures necessary to manufacture the precision components and seals demanded by applications such as wind turbines and tunnel boring equipment where diameters of 8 to 11 metres are common, or pipeline isolation seals and plugs which require homogeneous moulding of elastomer material at very large sections.
Since its formation in the 1880s James Walker has succeeded and grown by pioneering innovations in sealing technology and quality.

From pioneering the introduction of the ‘O’ ring in the 1930s through the formulation of rapid gas decompression resistant elastomer compounds to today’s state of the art compounds for the nuclear, pharmaceutical and oil & gas industries, James Walker continues to lead the way.

130 years of experience

Materials science

Our developments in elastomer materials have in many instances been at the heart of industrial change...

1930s – James Walker pioneers the introduction of the elastomeric ‘O’ ring seal.


1992 – Launch of Elast-O-Lion® 101 with enhanced mechanical and RGD resistance properties.

2006 – Launch of the first Elast-O-Pure® material specifically formulated to meet the demands of the biopharmaceutical industry.

2006 – Shieldseal®, radiation resistant and radiation shielding elastomer materials launched.

2010 – New generation of elastomeric materials, providing a step-change in performance to cope with increasingly hostile operating environments.

2012 – James Walker takes the lead again in elastomer compounds for the nuclear industry with Shieldseal® 663 and 664.

2017 – Launch of Vermilion, a new range of chemical, RGD and low temperature resistant elastomers for the oil and gas industry, once again creating a new benchmark.

Developments in materials science and seal design that have helped enable significant advances in industry

With continual investment in our own world-class materials and product testing facilities, plus the recruitment and retention of experience and expertise in materials science and application and product engineering at our hubs and key facilities around the globe, we believe that James Walker offers an unrivalled service to global industry.

Seal & component design

Advice – Media, temperature, pressure, speed...there are many variables that will impact upon the successful performance of your seal or component and James Walker can provide expert opinion to help you choose the correct option.

Validation – From computer modelling and FEA analysis to test rig validation and field trials, we have the resources and experience to offer a full validation service including results interpretation and recommendations on design improvements.

Prototyping – With in-house compounding facilities including a pilot mixing plant for small batch production, we can offer a full prototyping service and production trials.

Turnkey service – If all you have is a problem, James Walker has the experience and facilities to take you from a blank sheet of paper right through to finished product all within a strictly controlled confidential framework.

Meeting the challenges of tomorrow’s environments and applications
Health warning: If PTFE or fluoroelastomer (e.g. FKM, FFKM, FEPM) products are heated to elevated temperatures, fumes will be produced which may give unpleasant effects, if inhaled. Whilst some fumes are emitted below 250°C from fluoroelastomers or below 300°C from PTFE, the effect at these temperatures is negligible. Care should be taken to avoid contaminating tobacco with particles of PTFE or fluoroelastomer, or with PTFE dispersion, which may remain on hands or clothing. Material Safety Data Sheets (MSDS) are available on request.

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Statements of operating limits quoted in this publication are not an indication that these values can be applied simultaneously.

To ensure that you are working with the very latest product specifications, please consult the relevant section of the James Walker website: www.jameswalker.biz.

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