

James Walker®

Wind energy

Issue 1

- Simplifying assembly
- Extending component life
- Reducing maintenance
- Minimising running costs
- Improving reliability



High Performance Sealing Technology



Respected reputation

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Over a century of experience

James Walker has been in the business of fluid sealing and control for over 130 years. From our earliest products the company has developed solutions and components in parallel with advances in engineering technology. As a result, we have amassed specialised knowledge across a broad range of applications and issues.

Since those early days, our products have increased beyond recognition in range and technical excellence to match the complex and demanding applications of today's plant and equipment.

Over 130 years of applications engineering experience



Worldwide distribution

Our role as a global supplier demands an international manufacturing base, plus highly efficient sales and distribution operations. We have a worldwide family of companies with over 50 production, engineering, distribution and customer support sites spread across Europe, Australasia, Asia Pacific, Africa and the Americas.

At the local level, a close-knit network of James Walker companies and official distributors work in close partnership with customers in well over 100 countries.

A history of innovation

Driving development

Our position as a technology leader, in combination with the vast experience of our applications engineering and materials science teams, helps us to identify and supply the most appropriate and competitive solution for each individual customer's requirement.

We run a structured development programme for each of the industrial markets served by the business, working in partnership with customers to identify the current and future needs to be addressed, and to improve key performance parameters such as cost effectiveness, longevity, safety and environmental care.



One of the many James Walker in-house test facilities, which provide accurate simulation of actual operating conditions

.... A highly structured product development process focused on high-performance solutions that complement customers' operational demands

James Walker products are globally recognised by engineers for their quality and reliability. These are assets the James Walker name and Lion logo have fostered since the 1880s when our Scottish engineer founder, Mr James Walker, introduced his innovative packing for high-efficiency steam engines.

Delivering quality

Quality design, quality manufacture and quality service are paramount throughout our worldwide operations. We start with the best raw materials and use advanced manufacturing techniques with strict quality control to deliver high quality solutions.

This culture is reinforced by top-level technical, sales and logistics support to ensure a total quality service to every customer.

Proving performance

Working in close co-operation with customers, industry bodies and academic institutions, our facilities provide detailed data – bridging the gap between virtual FEA and actual operational application. This gives our customers the confidence that James Walker products have been fully tested to meet the required application conditions.

With our broad range of engineering resources and expertise we design and build custom test-rigs for many of the projects we undertake. In addition, and central to our research and development programmes, the James Walker Technology Centre houses the core of our world-class test facilities.

From concept...

Enabling advances

Our vast ranges of fluid sealing products and associated components are widely used across the full spectrum of renewable energy applications. The quality and longevity of our products are valued by OEMs and operators, underwriting equipment reliability to minimise plant downtime.

We have a specific strategic focus towards the renewable energy industry with dedicated technical resources for the research and testing of seal designs and components for renewable energy applications.

Working together at the early concept stage

The impact of a sealing or bolting solution upon the reliable, efficient performance of a wind turbine should never be underestimated.

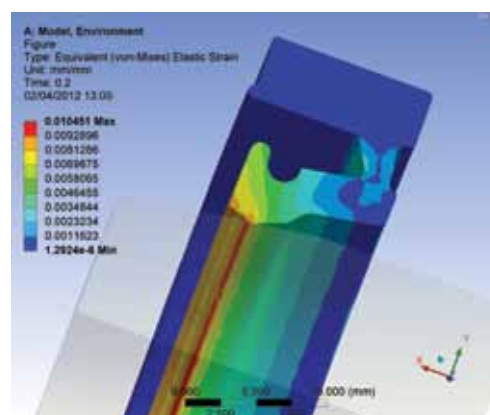
Considering the performance, fitting and replacement of these components should therefore be an integral part of the overall design process.

Early involvement of our applications engineering teams can eliminate potential operational problems at the design stage

The most effective solutions are those developed through early collaboration, where our engineering teams are able to contribute ideas and advice that will provide inbuilt reliability and performance in the finished project.

Bespoke solutions

At James Walker our aim is to create the most effective solution and we focus carefully on optimising the lifetime cost of ownership. Our approach is to work in partnership with our customers, jointly developing solutions in close cooperation with their own engineering teams.



Customer specific design

We carry a global reputation for solving sealing problems, a reputation that stems from the expertise and experience of our engineers and material scientists. Their knowledge and understanding is the inspiration for each solution, which is then challenged, refined and tested as it moves through the product development process.

FEA (finite element analysis) techniques are used for modelling seal designs and fine tuning different aspects, such as lip geometry and materials specification, to obtain the required performance.

These developments then move to prototypes that can be fully tested on a suite of static and dynamic test rigs to simulate, as closely as possible, the anticipated operating conditions.

...to installation

World-class test facilities

As a global provider of sealing and bolting solutions to virtually every industrial sector, James Walker has developed a range of test facilities and regimes that is second to none.

These facilities are not only essential for the success of our own materials and product development programmes but also provide our customers with the empirical data they require to fully assess and place confidence in a potential solution.



Examples of our test facilities include;

- Multiple rotary and reciprocating test rigs with a variety of shaft sizes and speeds from gentle oscillation to in excess of 6,000 revolutions per minute.
- Environmental chambers capable of replicating conditions from -70°C (-94°F) to +130°C (+266°F).
- Advanced materials laboratory for testing the effects of temperature, chemical environment and ageing on elastomeric materials.
- Computerised data collection on test rigs to assess friction levels and heat generation at the seal interface.
- Lubricant compatibility testing to ensure the long-term suitability of seal materials in contact with application lubricant or sealed media.



On-site engineering

No one knows how our products should be fitted and operate better than the engineers who design them, so whenever necessary our application engineers will be out on site, whether that is an OEM manufacturing plant or offshore turbine installation.

Supporting our customers with this sort of hands-on approach allows us to train customers' personnel and provides our own engineers with valuable first-hand experience that assists further product improvement and development.

No amount of laboratory work, computational modelling and bench testing can ever match first-hand experience and James Walker's field service work is an invaluable asset when it comes to solving problems.

James Walker
products ensure that
critical applications
across a wide range
of industries run safely
and reliably day
after day
after day...

Materials science

Materials choice

It is essential that the materials used in component and seal manufacture are:

- Chemically compatible with the operational media / lubricant
- Stable at the required working temperature
- Able to withstand operational loading / impact
- Capable of handling required variations in operating conditions
- Wear resistant under the operating conditions
- Suitable for application operating speed
- Offers minimal friction / resistance to shaft rotation

In-house formulation and compounding of elastomers, composites and thermoplastics provides total control over material quality

Special requirements

When our standard materials are unsuitable, we will tailor a compound to meet your specific operational requirements, typically for:

- Higher or lower temperature duties
- Additional ozone resistance
- High strength / low weight
- Additional abrasion resistance
- Impact and shock resistance
- Eco-friendly fluid compatibility
- Lower power consumption

In view of the wide variety of lubricants and fluids in use, some of which can be particularly chemically aggressive, we recommend that we carry out tests for compatibility.

Quality assurance

James Walker in-house material formulation and compounding offer technical superiority and full traceability.

Our Materials Technology Centre houses one of Europe's most advanced facilities for elastomer batch production. At its heart is a computer controlled internal mixer that holds formulae for over 300 of our elastomeric compounds.

Each batch of compound is subjected to rigorous testing and statistical process control before being allowed into the manufacturing process. This ensures we achieve consistent quality and operational performance in our finished products.



With the vast majority of James Walker products being employed in critical applications, the same strict quality regime continues throughout the manufacturing process.

Using a combination of the latest inspection technology and manual product checks by highly experienced and skilled personnel, everything possible is done to ensure our products arrive for installation to the tightest possible specification.

Applications engineering

Extreme environments

Our capabilities in high performance materials science are relied upon worldwide by customers who need top quality materials that are validated and proven to operate:



- At extremes of pressure
- In dusty and physically abrasive environments
- At extremes of temperature
- Where failure could have significant health & safety, environmental or financial risk
- To the highest safety and performance specifications laid down by international industry bodies
- In environments of an extremely arid or wet nature
- In offshore environments subject to high levels of ozone and salt spray

Engineered solutions

James Walker's capabilities in formulating and compounding its own materials provides our application engineering teams with the best possible start to developing effective sealing solutions and has assisted in the creation of design solutions that are now accepted as industry leading options;

Walkersele-OSJ® – innovative technique for on-site joining and installation of seals that provides a high integrity seal without the need for plant stripdown.

HydroSele® – leading cartridge sealing option for hydropower turbine main shaft sealing.

KlickFix® – innovative pump shaft seal with multiple, sequentially deployable sealing elements.

James Walker is in a unique position to offer the highest level of expertise through a series of specialist technology and manufacturing centres of excellence;

James Walker & Co

Advanced sealing materials development, manufacture and applications engineering.

James Walker Devol

High performance engineering in advanced thermoplastic materials.

James Walker RotaBolt

Assured bolted joint integrity through bolting installation and tension control management systems.

James Walker Keaflex

Design and manufacture of complex, precision moulded elastomer products.

James Walker Tiflex

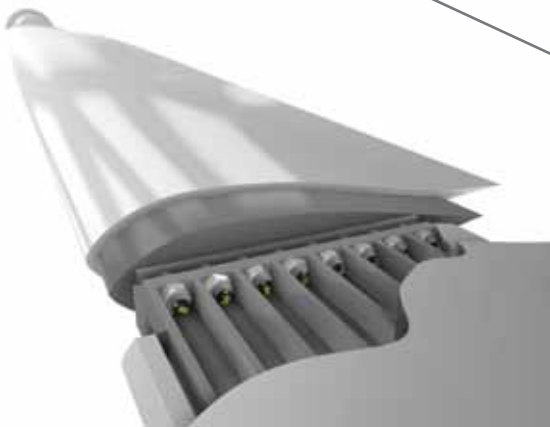
Development of advanced cork-elastomer composite materials for vibration attenuation.

System solutions

Blade root and hub bolting

Assured reliability means turbine builders and operators can now realistically reduce maintenance regimes for bolted joints.

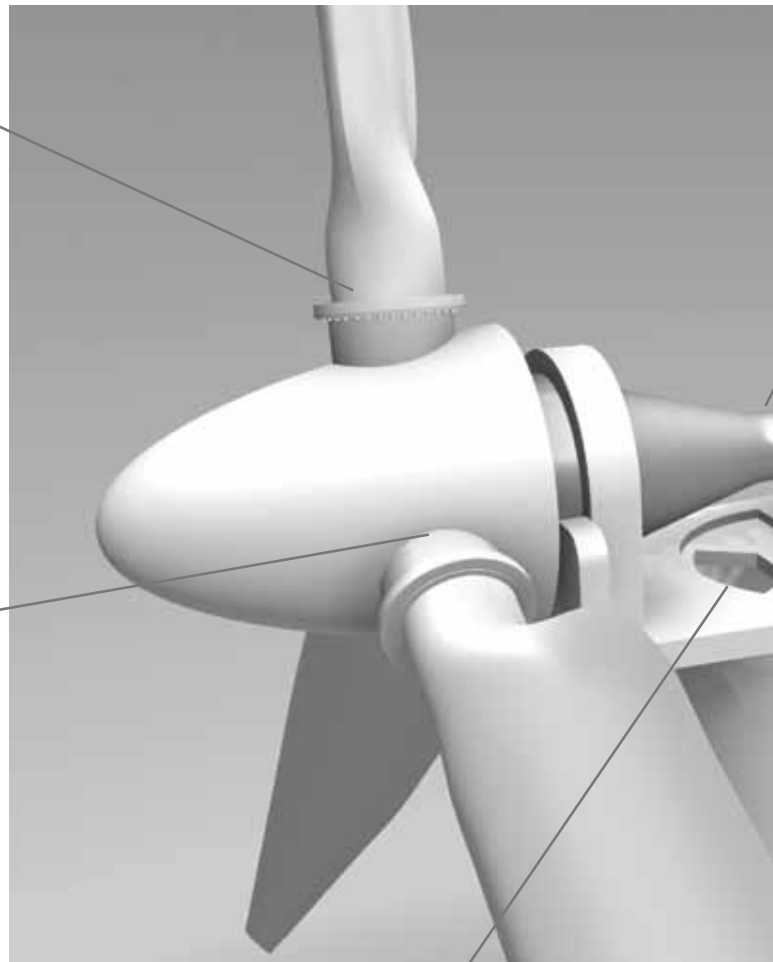
With RotaBolt®, time consuming and costly bolt checking based on retightening can be replaced with instant, finger-tip or visual checks of tension.



Blade root sealing

Working with turbine and blade manufacturers, James Walker has developed bespoke options for endless and on-site joined blade root seals.

These offer long life and easy replacement and put a stop to lubricant loss that results in unsightly blade and tower staining, costly clean-up maintenance and potential pollution of the immediate biosphere.



Slew bearing sealing

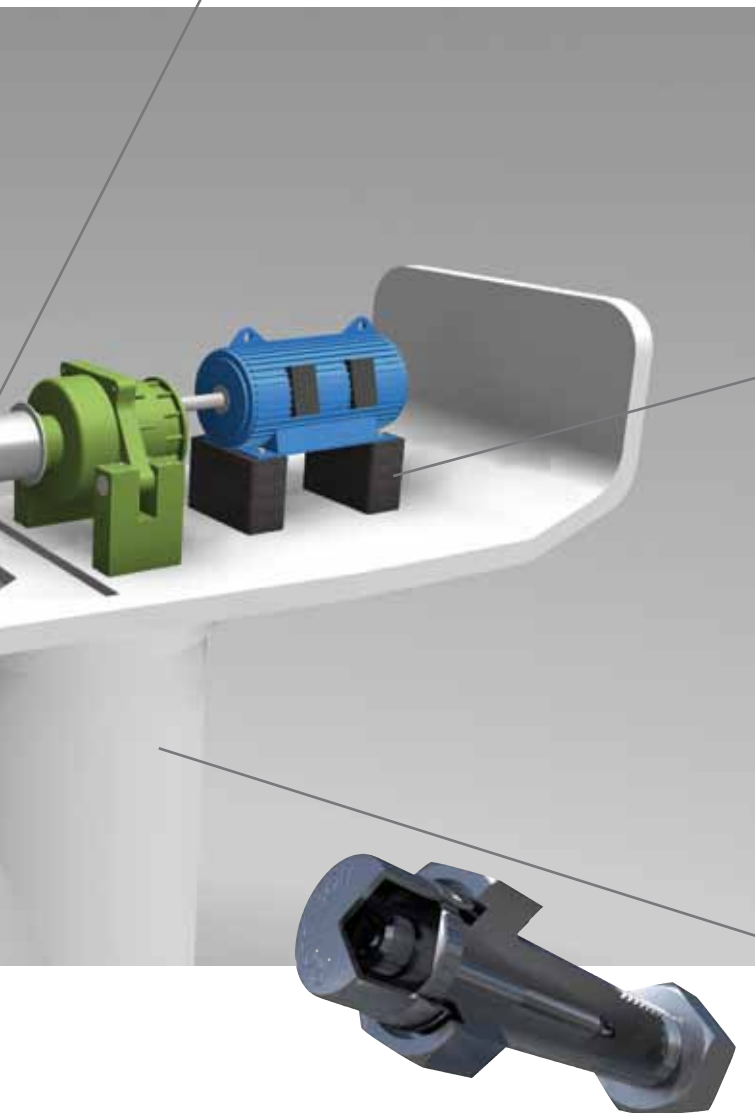
RotaBolt® tension control bolting ensures even tension across large diameter bearings, whilst Walkersele® radial lip seals ensure long-term, reliable protection for the bearing, eliminating lubricant loss and harmful ingress of damaging contaminants.

System solutions

Main bearing shaft sealing

James Walker specialises in the design, development and manufacture of main bearing shaft seals, with the capability to produce the largest diameters required by the industry.

With material and seal designs approved by both bearing and turbine manufacturers, we offer main shaft and gearbox seals in a variety of high performance materials covering low temperature, low friction and long-life requirements.



Protective mouldings

Protecting sensitive mechanical and electronic components from dust and moisture helps eliminate one of the main causes of generating downtime availability.

James Walker provides design and manufacturing capabilities for complex flexible components in a wide choice of elastomer materials.



Machinery mounting

Eliminating the transmission of vibration between the separate elements of a turbine helps reduce wear and the risk of associated damage.

The James Walker range of Tico® mounting pads has been developed and proven in a broad range of heavy industry and extreme environments.



Tower bolting

Using RotaBolt® tension control systems allows turbine manufacturers and maintenance operators to drastically reduce the time required for maintenance checks – just 30 minutes for a full 'A test bolt check', and can even reduce bolt content by up to 50%, saving manufacturing time and materials cost.

Sealing expertise

Shaft & slew bearing sealing

James Walker has been supplying custom sealing solutions to the wind industry since the very earliest days of wind power generation.

The company has continued to invest in production, testing, design and materials technology that now places James Walker at the forefront of seal design and manufacture for wind turbine applications.

The business now offers manufacturing capabilities to handle the largest diameter seals currently envisioned in turbine developments plus the formulation of elastomer compounds to meet the demands of turbines operating in the most extreme environments.

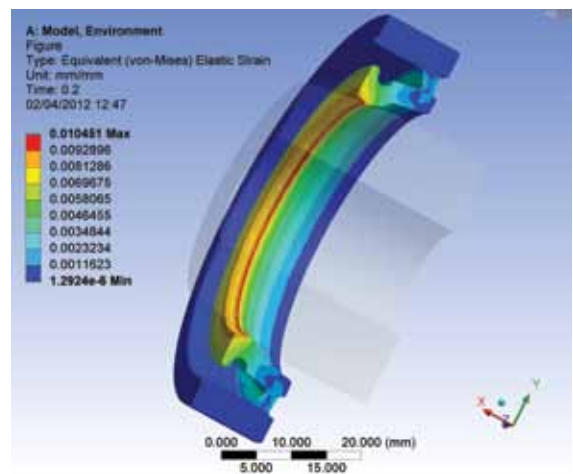
Taking the respected and proven range of Walkersele® radial lip seals as a starting point, our applications engineering teams tailor final configurations to optimise performance against the specific requirements of each application.



From slew ring bearing seals on the largest turbines to main shaft seals on the latest generation of direct drive turbines, James Walker continues to work with component OEMs to extend the operational capabilities of tomorrow's turbines.

Blade root sealing

Following early success in developing a replacement seal that could easily be retro fitted on-site to overcome the problems of lubricant loss, James Walker has now developed a number of sealing options to suit different blade root housing configurations.



The designs are based on the well proven James Walker Solosele® G - a robust elastomeric lip seal reinforced with an integral anti-extrusion element of rubber-proofed fabric.

The highly developed lip profile enables this seal to work efficiently for many years even on a blade root that rotates out-of-true or runs on worn bearings.

Solosele G also offers bearing protection even under the axial and radial loads experienced in a blade root application.

Our programme of continuing product evolution and close working relationships with OEMs, ensures that the solutions developed are keeping pace with changes in blade root technology.

Sealing expertise

On-site seal joining for reduced downtime and maintenance costs

Developed in conjunction with customer maintenance engineers, the Walkersele OSJ®-2 system offers seal replacement without the need for specialist services or equipment.

Using Walkersele OSJ-2, a main shaft or blade root seal can be replaced without a need for major disassembly.

The resulting seal is no short-term fix, but a permanent seal with the same performance levels and continuity as the original endless version fitted by OEMs.

- Simple, rapid fitting
- Cuts fitting costs and downtime
- Fully moulded endless-seal performance with split-seal assembly convenience
- Available for shaft sizes from 60mm (2.3") upwards

The beauty of this product lies in its simplicity - after just a few hours' hands-on training, a maintenance fitter is able to produce a securely bonded joint that provides a split Walkersele® with the integrity of a fully moulded endless seal.



James Walker constantly works with bearing and turbine manufacturers to ensure components and assemblies are designed to facilitate the use of on-site joining within the maintenance regime.

Customised materials

James Walker standard materials meet the highest quality and performance capabilities, but where extraordinary or unique operational conditions need to be met we will tailor a compound to meet customer requirements such as:

- Higher or lower temperature duties
- Additional ozone resistance
- Additional abrasion resistance
- Eco-friendly fluid compatibility
- Lower power consumption

Complete control of elastomer materials development through in-house formulation, compounding, testing and validation

Developments to date have produced a range of elastomers formulated to address the current operational demands of the wind power generating industry;

- Low friction
- Long life
- Low temperature capability

Looking to the future, James Walker development engineers and materials technologists are working with turbine operators and component manufacturers to create the innovations in sealing technology that will further extend maintenance intervals, improve turbine performance and potentially offer 'fit and forget' lifetime sealing.

Bolting technology

Innovative technology

Tension control is essential in achieving 100% reliability. Our unique RotaBolt® fasteners not only achieve the correct tension at installation, they maintain this throughout the life of the bolted joint.

RotaBolt tension control fasteners are individually 100% load test calibrated and every bolt's extension measurement is individually certified.

RotaBolt®
bolting technology
provides significant
improvements in
safety and reliability
without any
requirement for
specialist expertise



For further details, request or download the James Walker RotaBolt Guide to Assuring Bolted Joint Integrity

Critical factors

Bolted joint integrity relies on three critical factors:

- Joint design
- Bolt quality
- Tension control

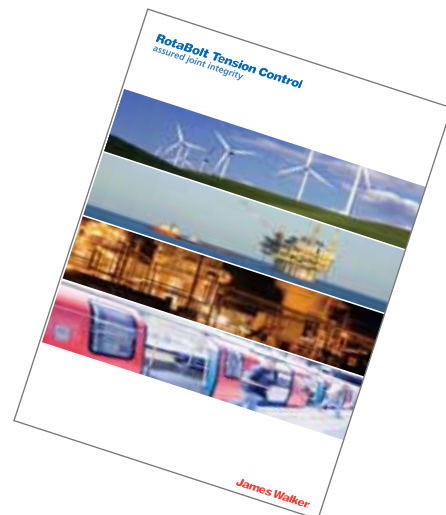
The first two of these factors are controlled and measured.

The operator may well be highly trained and the installation procedures followed to the letter, but failure can still occur if all three reliability factors are not properly measured.

90 – 95% of all bolted joint failures are attributed to insufficient bolt tension on installation.

Traditional tightening methods, such as torque and hydraulic tensioning, measure the effort applied and not the tension achieved across the bolted joint.

It is tension control that is critical to the reliability and safety of bolted joints.



Tension control

Joint Integrity

A broad range of benefits can be derived from maintaining reliable bolted joint integrity using RotaBolt®.

- reduced maintenance costs
- better design efficiencies
- reduced installation costs
- improved safety
- reduced build costs
- enhanced design performance
- reduced operational costs
- extended equipment life

Improved reliability

Assured reliability means turbine builders and operators can now reduce maintenance regimes for bolted joints.

With RotaBolt systems, time consuming and costly bolt checking based on retightening can be replaced with instant, finger-tip checks of tension.

It takes 10 hours to check just 10% of the bolts in a tower using traditional retightening – and then it's not an assured check of tension. With RotaBolt it takes just 1/2 hour to carry out a complete, assured check of every single bolt.

The 'A Test' bolting check for a turbine tower can be completed in just 30 minutes.

20 years experience of assuring joint reliability in the offshore oil and gas industry with the RotaBolt system has also shown that after the initial 100% bolt check, the next check can be 5 YEARS later.

Enhancing turbine design

Our technologies deliver safe, reliable joints as well as improving design efficiencies, machine rating and production build.

Applying tension control technology can reduce bolt content by up to 50%. This impacts on design and performance, reducing both production and installation costs - less holes to be drilled, less tightening and less checking.

RotaBolt® tension control fasteners have Germanischer Lloyd approval covering wind turbines, as well as DIBt approval for tower constructions.



Reduced build time

The speed of construction can also be reduced by the use of RotaBolt Integrity, the world's first complete bolt installation system that delivers assured joint integrity through tension control - every time. The system is the result of an alliance between the two global leaders in tightening control and bolted joint technology – Hytorc and RotaBolt.

Together we have developed the Integrity tightening tool which automatically senses when the special cap has locked on top of the RotaBolt fastener and immediately cuts off the hydraulic tightening power, accurately achieving the correct tension.

Working in partnership

Seal design

With the present rate of development in the wind energy industry, each major project appears to throw up a new set of operating, environmental and maintenance conditions.

In addition to working with OEMs to provide the best possible sealing solutions for individual projects, James Walker is also working on the longer-term industry desires including;

- Maintenance-free seals
- 25 year minimum life
- Shaft wear reduction
- Easy-fit seal formats

In-house formulation and compounding of elastomers and thermoplastics provides total control over material quality

Manufacturing requirements

We have already seen considerable changes occur in seal designs, materials and sizes as the wind energy industry has grown and have taken steps to ensure that the James Walker business will be capable of meeting the requirements of the industry in the future.

Continual investment in dynamic test facilities and materials testing, as well as new production equipment and processes capable of handling the largest diameters and most complex profiles, means that James Walker is in a prime position to help designers and OEMs develop future generations of wind power generating units.

Materials science

In parallel with our developments in seal design, James Walker maintains a continual materials development programme. Across all industrial applications we are continually seeking to improve material performance.



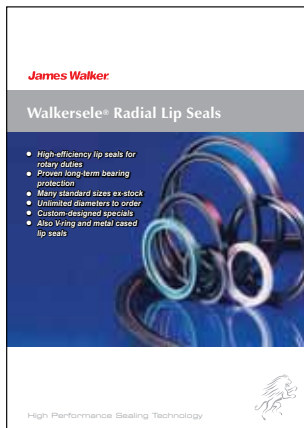
The Materials Science department at the James Walker Technology centre in the North of England works with the suppliers of our raw materials to refine existing and develop new compound formulations, often with the aim of producing a custom material that will provide specific performance levels under a unique set of operational conditions.

Specifically at the request of OEMs within the wind power industry, James Walker is currently focused on compounds that provide outstanding performance in the following areas;

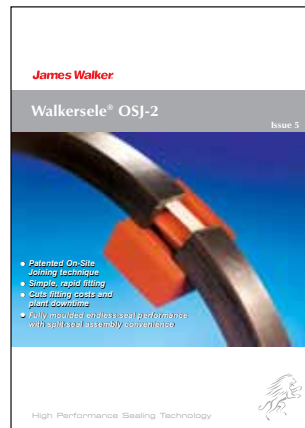
- Low friction
- Long life
- Low temperature
- Ozone resistance
- Biolube compatibility

Technical guides & data sheets

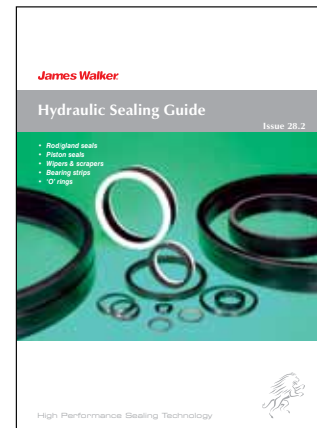
These guides give detailed technical information on the products and services supplied by James Walker to the wind and renewable energy sectors. Please ask for your copies, or visit our website www.jameswalker.biz where many of them can be downloaded in pdf form.



Walkersele® radial lip seals



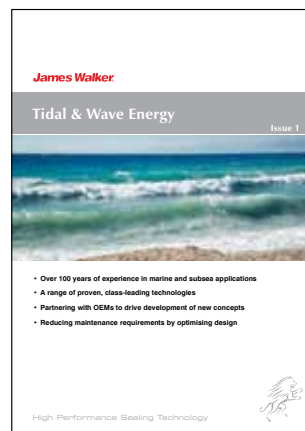
Walkersele® OSJ-2
on-site joining



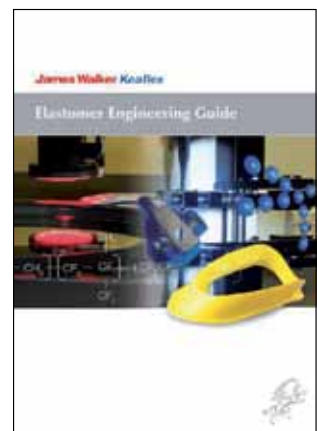
Hydraulic sealing guide



Joint integrity for wind energy



Tidal & wave energy



Elastomer engineering

General information

Information in this publication and otherwise supplied to users is based on our general experience and is given in good faith, but because of factors which are outside our knowledge and control and affect the use of products, no warranty is given or is to be implied with respect to such information. Unless governed by type approval or contract, specifications are subject to change without notice. Statements of operating limits quoted in this publication are not an indication that these values can be applied simultaneously.

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

Environmental statement: This brochure is manufactured using advanced environmentally friendly technologies and follows the strict environmental standard BS EN ISO 14001. Made from chlorine-free pulp (ECF) with post-consumer recycled fibre obtained from sustainable wood forests, and printed using vegetable-based inks, by Binfield Printers Ltd. For those who wish to reduce further their impact on the environment, this publication is also available as a PDF from: www.jameswalker.biz



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