AEMT

Journal

Volume 15 Issue 1 www.theaemt.com

Association of Electrical & Mechanical Trades

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AEMT Journal

VOLUME 15 | ISSUE 1

Front cover photos:
A JCB hangs from the ceiling; see Fletcher Moorland article.
Quartzelec's flexible test bed with large DC machine.
ATB Morley's tidal induction generator.

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AEMT COMMENT

A Slick Outlook for a Digital Future.

This bright yellow summer edition of the AEMT Journal reflects the rejuvenating time it is published. Just as we all relax and reflect on what the first half of the year has offered, we also look forward to the opportunities for the rest of the year.

Inside we complete our tour of the impressive Quartzelec Rugby facility, having looked closely at the Quartzcoil division at the beginning of the year in the last Journal. The opening of the workshop in 2013 gave rise to one of the most advanced test facilities of its kind anywhere in the world for HV machines.

As the AEMT celebrates its 70th year this summer, so too do many of its members who started up just after the end of WWII. Fletcher Moorland are one of these companies. The JCB on the font cover comes from one of the companies that rely on Fletcher's reliable services, MD Matt Fletcher looks at why they continue to be so successful.

If you are taking a dip in the English seas this summer, you might be thinking of all the energy that could be harnessed from it. ATB Morley has been riding a tidal wave of success after providing a bespoke induction generator for Wale's first full-scale tidal energy development. Speaking of water, Exalto is making its mark in the global market for water lubricated bearings, having just completed their expansion plans. Its success has been down to high levels of stock and fixing its costs, building trust and reliability among its customers.

We also take a look at other suppliers to the industry including Wire Electric Supplies and Rotary's new OEM design language, both of whom are pushing the boundaries to provide exceptional bespoke service.

In a world that is changing immeasurably fast, we also examine how Siemens are already installing Smart Factories around the globe, and AEMT members take a tour around their Leeds based DF&DP assembly plant to learn more.

Thomas Marks

Editor and Marketing Manager

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This transformer might well be the most efficient Ecodesign transformer in the world

It's called the Ecodesign, and it's manufactured in-house by Bowers Electricals – the famous family-run Derbyshire business that's been keeping companies across the world ticking over since 1947.

The Bowers Ecodesign range has been developed to help businesses meet the new EU Commission Regulation 548/2014. The new legislation is aimed at small, medium and large power transformers, and requires them to meet strict minimum energy efficiency requirements. It's all part of the EU's 20-20-20 aim to achieve a 20 per cent reduction in energy consumption by 2020.

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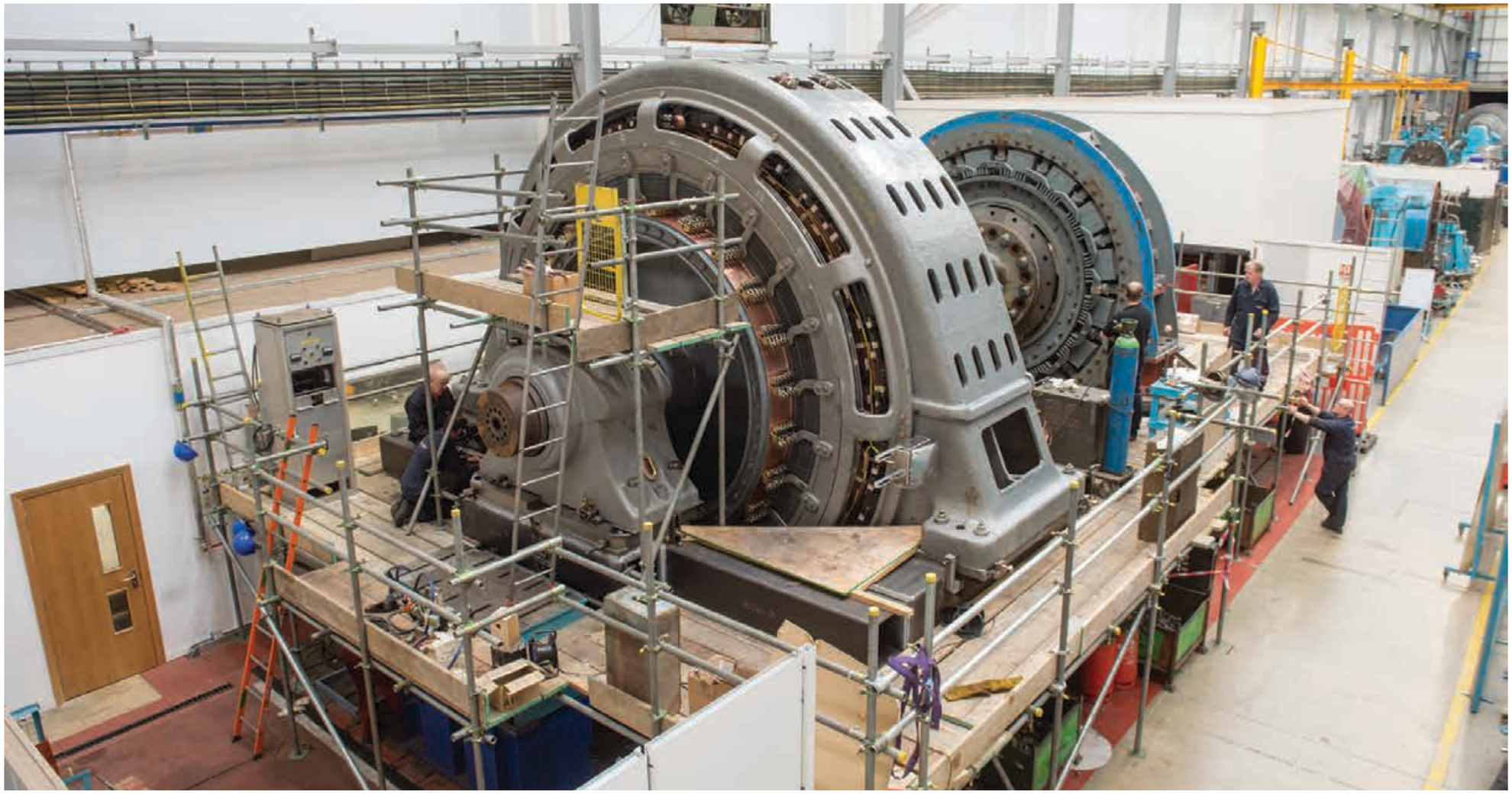

The Quartzelec Rugby rotating machines workshop incorporates one of the most advanced test facilities of its kind anywhere in the world. With an overhead crane capacity enabling machines of up to 50 tonnes (100 tonnes combined) to be tested and a new viewing platform ensures that clients can witness first hand their machines on test from the comfort and safety of a dedicated control room complete with all the latest data acquisition computer driven protocols. Pic shows the flexible test bed extended to accommodate testing of a large DC machine.

Quartzelec aims big with ongoing workshop investments

Quartzelec Rugby is an organisation with big ambitions. The opening of its new rotating machines workshop in 2013 enabled it to handle much larger AC and DC machines, win new orders and build its reputation for highly customer-focused service. The investments are continuing with even more modern facilities planned and scope to handle even bigger, more specialist machines being planned.

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When Quartzelec opened the doors to its new Rugby-based rotating machines workshop in 2013, the UK gained one of the most advanced facilities of its kind anywhere in the world. The dedicated workshop can run a wide range of dynamic and static tests on all types of rotating electrical machines (AC/DC motors and generators), gearboxes and transformers to national and international standards, either as a stand-alone service or as part of a repair or overhaul project.

The purpose-built works features state-of-the-art digital control and data logging instrumentation; the latest technology for on-site machining, balancing and testing; heavy lifting equipment including an impressive 80-tonne overhead swing crane; and much more. For example, the test equipment's new power feed enables forward short circuit testing of much larger machines than Quartzelec has previously been able to handle in Rugby. Now the company can test machines up to 7MW at full current/reduced load and 710/800 frame size, substantially greater than the previous site's limits of 1.2MW and 450 frame size machines. Since its opening, the new facility has enabled Quartzelec to win new business both from within the UK and internationally.

INTENSE ATTENTION TO DETAIL

Such success is partly down to Quartzelec's strict attention to detail during the workshop's £1 million, 12-month design and build. *"Careful analysis and evaluations were made during 2010/11 and a decision was made to invest and build a new facility while also keeping our heritage in the famous town of Rugby. Location of the workshop was an important decision, with Rugby not only being the company's home but offering easy access to the M6 and the nation's motorway network to ease the moving of the large machines we handle,"* explains Mr David Clegg, Sales & Marketing Manager, Quartzelec.

With this in mind, the new facility's access door was designed to be 300mm higher than motorway bridges. A small detail, but one with important consequences for Quartzelec when it was asked to help a client that was experiencing significant commutation issues with a 4,122kW, 1,000V main mill drive motor at its factory in Europe.

HUGE 68 TONNE ARMATURE HANDLED

The project involved swapping the existing armature for the spare unit, transporting the original armature to Rugby, removing and refurbishing the commutator with new copper, cleaning, testing, refitting the commutator, and returning and reinstalling the unit.

Quartzelec Rugby was one of the few in-house DC machine test facilities able to undertake the work because it could accommodate the sheer size of the armature: 7 metres long, 4 metres in diameter and weighing 68 tonnes. Apart from extracting such a large armature from the machine, special transport permits were required for the transit through Europe and the UK.

Indeed, testing the machine proved to be a challenge and involved a temporary extension of the test facility, including the design and manufacture of a rigid support for the motor on live test.

David takes up the story: *"Testing the motor was a major part of the project as the customer required us to demonstrate the machine's overload capabilities against a very tight specification. Results considerably*

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Delivering a 7 metre long, 4 metre diameter, 68 tonne armature for testing at Quartzelec Rugby - special transport permits were required for the transit through Europe and the UK

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exceeded expectations, with overload current measuring 8500A in both directions against an initial design specification of 3800A. We also performed black band testing on the commutator and magnetic saturation curves, again exceeding expectations."

After completing the extensive test work, ten Quartzelec engineers and the Project Manager travelled to Europe and performed the exchange of the overhauled machine with the spare. *"Our client complemented Quartzelec on the total works, especially the speed of the exchanged machine."* says David.

FASTER, QUIETER AND GREENER TESTING

It is this larger end of the market that is the focus of the Rugby site.

Quartzelec Rugby offers overhauls, repairs, servicing or diagnostics, with a coil facility also on site and a nearby fabrication shop that makes the service a true one-stop-shop for many of its clients.

As well as investing in the most modern equipment and designing the facility to accommodate large machines, Quartzelec has created an area that facilitates a more efficient workflow process. This, plus the comprehensive data logging capabilities, has meant a faster turnaround of many projects and at lower cost. This is passed on to their customers, making it more competitive.

Many of the test projects are witnessed by the customer and here too, Quartzelec has applied its thoughtful design to make life easier for clients, building a fully sound-proofed control room for comfort and convenience. Using continuous data logging capable of 32 readings per second, test data can be collected more rapidly, for faster overall testing, and reviewed by the customer in great detail.

As well as providing a comfortable environment for their staff and customers, the Rugby plant implements many initiatives formed during the planning stage to ensure the highest energy efficiency using the latest cabling and switchgear. For example, much of the testing is run using self-generating power. The result is that Quartzelec Rugby has been awarded the ISO 14001 environmental management certification.

"Customer feedback is generally about how clean, modern and organised the facility is, with everything where it should be and with the whole testing process being efficiently managed," comments Harry Jones, Workshop Manager. *"It's an important aspect in building customer confidence in our professionalism and expert capabilities."*

BEING A TRUSTED ADVISOR

Quartzelec Rugby's reputation for good service does not depend just on its expertise and modern facilities, of course. The company culture to always offer its customers the most cost-effective solutions is also vital.

A recent example demonstrates this attitude plainly, as Harry explains: *"One of our established clients called the other day asking for our advice and support following an incident in which one of their machines had tripped on the protection relay. The client wanted an engineer to fly to site to determine why the machine could not be put back into service.*

"While we were making the necessary travel arrangements, we got back to the customer to recommend a few simple electrical tests and asked them to remove a few covers and take pictures of the internals. Although the client did not have any equipment to test the winding, they sent back a few pictures that revealed burning on the windings and an obvious area of failure. At this point we called and told the client we would not be sending an engineer because the fault was clearly caused by the stator winding flashing over. We advised that shipping the machine back to the UK would be very costly and recommended a local repair company," Jones says.

Extensive range of capabilities for testing a wide variety of machines; a sound proofed control room with a state of the art control system and [pictured] the extensive test facility's machine room fed from a 500Vdc 12-pulse rectifier on an 11kV grid supply.

The result? Quartzelec lost the order but was able to build a much closer relationship with the client by being honest and offering money-saving advice. Subsequently, the client made recommendations to all its subsidiaries to contact Quartzelec on all matters related to rotating equipment.

LOOKING TO THE FUTURE

Quartzelec is not sitting back and simply enjoying the success brought about by its new capabilities, but is continuing to look at ways to further improve its services and tackle new business opportunities. New investments in tooling aim to simplify test work; new test equipment will deliver results that are easier for clients to understand quickly; while new, programmable machine tooling, high-frequency brazing equipment and other improvements will replace obsolete equipment. The company is also looking at new technologies, such as robotic winding machines.

Such investments are not made in isolation but are guided by market insight and client feedback, says David. *"We've analysed the current market and discussed with many of our clients how we can best continue with the support we offer. We see that many of our competitors have been acquired by bigger OEM type companies and with this comes new opportunities. Quartzelec is totally separate from those OEMs and can offer a more cost effective service."*

The rotating machines market is continuing to expand and develop, with older machines needing servicing and repairs. Safety and protecting the environment are growing market drivers. Many older machines have asbestos insulation for example.

"We are one of only a very few companies able to refurbish DC machines. The DC machines market is steady with some processes, such as aluminium rolling, needing the high precision, high reliability and smooth operation of DC machines. The cost to replace an old DC machine with a new AC machine and all its foundations and fixtures can be three times higher than refurbishing the existing machine," David says.

"At Quartzelec we will continue to provide the high level of service both economically and efficiently as a competitive alternative to the services that the large OEMs can offer."

Another new growth area, and an ambition, for the company is to extend its services to cover even bigger machines. To achieve this, the company is steadily building up its expertise in very specialist areas, such as the large hydrogen-cooled and water-cooled machines used in power generation. Quartzelec recently completed a project on a smaller hydrogen-cooled machine without any problems, demonstrating its growing capabilities.

It's clear that Quartzelec is making the most of its Rugby investment to provide a platform for growth in the coming years.

"There are lots of new business opportunities opening up for us to tackle, not just in Europe, but as far afield as Canada and South America. We have the facilities and the expertise to make it happen," concludes David Clegg. ■

Cutless bearings for the global marine propulsion and pump industries.

Exalto makes its mark in the global market for water lubricated bearings

Within all sectors of the engineering maintenance, repair and OEM sectors, having ready access to manufacturers of critical components is a basic necessity. This has not gone unnoticed by Exalto UK Ltd, one the leading names in the manufacture of water lubricated bearings - otherwise known as cutless bearings - for the global marine propulsion and pump industries.

Now into its third decade, Exalto is steadily growing into a major force in this highly specialised industry, supplying standard and non-standard bearings to leading marine propulsion manufacturers, ship repairers, pump manufacturers and the pump maintenance industry in over 50 countries.

This reputation has been built on the quality of its products, innovative manufacturing techniques and a commitment to meeting customers' delivery requirements. For a small company it is a big challenge, but one that is being met by understanding their customers' needs, and providing a highly professional and personal service.

CUTLESS BEARINGS

The cutless bearing is precision engineered, tubular-shaped component manufactured from any one of a range of metals and containing an internal bonded profiled liner made from either rubber or composites. Lubricated by the water in which it operates, the bearing is a fixed sleeve through which a shaft passes and is held steady as it rotates. The benefit of being water lubricated is that no oil lubrication system is required.

A significant factor in the reliable operation of a cutless bearing is the dimensional accuracy of the internal rubber lining. Because rubber by its nature is moveable it is not possible to use single point measuring tools to accurately determine the true gauge. Although air gauges could be used, this method also has its drawbacks for Exalto because the large range of sizes manufactured and number of flutes making up the linings would require far too many air gauges to do the job. To overcome this problem Exalto has demonstrated initiative and innovation by developing its own customised range of plug gauges that ensure the bearings are of highest levels of accuracy and quality.

NEW IDEAS AND INNOVATION

The company's dedication to innovation doesn't stop just there for it is constantly looking at ways to improve efficiency and product reliability. This can be seen by its investment in testing and introducing new materials and manufacturing techniques. Then there is the investment in stockholding, ensuring that all standard products are readily available not just for key customers, but also to meet the needs of those faced with real emergencies.

While brass and phenolic shelled bearings are still the most commonly requested shaft bearings within the marine sector, there is a growing awareness of the advantages of using GRP as an alternative. GRP is a fibre-

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Manufacturing shaft sleeves to protect pump shafts.

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glass composite that is ideally suited to applications where galvanic corrosion is an issue, steel or aluminium boats being examples. Phenolic bearings are traditionally used in these situations but GRP does not expand in seawater, making it structurally stronger as well as easier to replace.

Equally, removal and replacement is easier than that of a brass bearing for it is suitable for fitting with an epoxy adhesive, eliminating the need for grub screws. The material itself is mechanically strong and there is the benefit that GRP bearings are cheaper and up to 60% lighter than brass shelled bearings whilst at the same time giving a similar service life and stability. Such has been the interest in these bearings, Luxfords Marine in Australia are now in the process of converting all their stock over to Exalto GRP bearings.

The marine industry also benefits from the company's Maritex bearing material which is manufactured from a combination of fibre, resin and lubricants that produces a premium plain bearing for high load, low speed applications. Offering extended life and enhanced shaft support, the Maritex bearing material is typically used for rudders or water lubricated shafts. Having a unique surface chemistry that resists marine growth, it does not deform with increased temperatures and is suitable for Arctic and Antarctic operating conditions. Exalto can supply Maritex in tube, square, hollow square discs and sheets, with grades also being available for chemical, electrical, mining and processing applications.

PUMP BEARINGS

Marine cutless bearings have been at the core of Exalto's business model ever since it was established by Exalto BV back in 1996, but in recent years it has moved into the manufacture of bearings for the pump industry. Here there is a growing demand for replacement parts from end-users and maintenance companies, as well as OEM's. Much of the work is for non-standard bearings, but with its comprehensive engineering and reverse-engineering facilities this does not present a problem for Exalto. So long as the required material is in stock and the technical drawings are available, new and improved bearings can be manufactured against tight deadlines and in accordance with all required industry quality standards.

Nitrile rubber is used as the standard lining because it is extremely tough and resistant to oil and chemicals. Alternatives can be offered as required, including Viton fluoroelastomer. Exalto is one of the few companies able to manufacture bearings with large shaft diameters from this material.

Exalto also has WRAS approval for its Maritex AquaPure composite material enabling the company to offer specialised water lubricated bearings for drinking water pumps. Encompassing submersible borehole pumps, booster pumps and vertical line shaft drinking water pumps, Maritex boasts lubricity approaching PTFE, but without any of the frustrating 'creep' typically associated with this material.

Maritex AquaPure offers almost no moisture absorption, excellent compressive strength and toughness, strong chemical resistance and good low start and dynamic friction. These benefits make Exalto's drinking water bearings fit for a wide range of duties, from high-speed pumps to slow turning, heavy loaded and mandatory zero-grease applications.
That the company is being successful in this market sector can in part be attributed to its size and flexible

A significant factor in the reliable operation of a cutless bearing is the dimensional accuracy of the internal rubber lining.

approach. The pump industry requires bespoke parts, so this specialist engineering service is particularly beneficial especially for OEMs and repair shops that supply the offshore and water industries where there are highly specific demands. Pump manufacturers that have taken advantage of Exalto's expertise include SPX, Weir, SPP Torishima, Clyde Union and ERIKS.

NEW HORIZONS

In 2009 Exalto developed a new business plan that reviewed all the company's practices and made some radical changes. This involved keeping high levels of stock for the marine industry in the expectation that customers would buy if they could get a rapid service. It then began offering long term deals to customers at fixed prices rather than letting them fluctuate according to the market. Finally, Exalto addressed the export market to develop new markets around the world.
The plan clearly worked. Structured as a five-year plan, the target was established three years early, a remarkable achievement for a relatively small enterprise at a time of global recession. But that isn't the end of the company's plans. The next stage is to consolidate the company's presence in several key markets over the coming years.

New and improved bearings can be manufactured against tight deadlines.

Developments such as becoming a distributor for Graphalloy® in the UK will help to achieve these goals. Graphalloy is a graphite/metal alloy used as a bearing material in the pump industry due to its ability to operate in the harshest conditions. This product is becoming increasingly popular with the company's pump customers and it satisfies some very particular requirements regarding pump operations where dry-running, heat and cold have previously created problems for some bearing materials.

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The cutless bearing is precision engineered, tubular-shaped component.

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A non-galling, corrosion resistant, dimensionally stable material capable of performing at extreme temperatures, Graphalloy maintains it lubricity in cryogenic conditions where lubricants cannot be considered. Being self-lubricating, it enables pumps to survive dry-running conditions, slow roll operations and frequent stop/starts. For Exalto, taking on distribution has added another dimension to the company's portfolio of bearing products and materials that it can offer to customers.

GLOBAL PRESENCE

In order to achieve its bold expansion plans Exalto has split the business into two parts with the responsibility for the marine and pump sides of the business being assigned to separate individuals.

For a small company it has big ambitions and it will continue to expand internationally and grow its reputation for British quality products and service.

It has built strong customer relationships on the back of its reliability, and it is this which has established its presence within the UK as being the company to turn to for quality products and service, and is enabling it to become a world leading supplier of bearings for both the marine and pump industries. ■

ATB Morley has supplied a bespoke IX100 induction generator for Wales' first full-scale tidal energy development.

ATB Morley – riding a tidal wave of success

ATB Morley has been supplying bespoke motors for the world's toughest applications for more than 100 years. While many things may have changed in that time, the company's aim of designing and manufacturing world-leading, innovative custom-made products has not.

But ATB Morley did not become the company it is today by simply sitting back and reflecting on past successes. We interviewed sales director Martin Needham about ATB Morley's exciting plans for the future, including further development of its fast-growing retrofit business, and new advances in the exciting world of tidal energy generation.

There can be few companies in business today that can claim to have been producing the same products on the same site for more than 100 years. The fact that ATB Morley is one, is testament to the quality and reliability of its products, and to its ethos of designing and building everything around the needs of its customers.

"ATB Morley's main differentiator is down to a strong engineering pedigree and knowing the business we specialise in. Our motors are designed and built to last, with a no compromise approach to quality, giving excellent reliability and low lifetime cost of ownership," explains ATB Morley's sales director, Martin Needham.

Today, ATB Morley supplies its bespoke products to more than 68 countries. This outstanding global performance has been recognised with several awards. In 2009 and 2012 the company was presented with the Queen's Award for Enterprise for International Trade, and in 2010 it received the Queen's Award for Innovation.

BESPOKE SOLUTIONS

ATB Morley was founded in 1897 to supply manufacture-to-order (MTO) and engineer-to-order (ETO) electric motors principally for underground coal mining. The mining industry remains the biggest part of its business to this day, accounting for 80% of the company's annual production output.

But that is where the similarities end.

Today, ATB Morley supplies an extensive range of motors, drives and generators to industries as diverse as waste water management, pulp processing and paper manufacturing, food and beverage production, metal processing, oil rigs and refineries.

ATB Morley was originally called Morley's Motors, a name it retained after it left its original site in Morley, Leeds in 1905 and opened for business on its current location, in Pudsey, Leeds. The company has since added a second site – in Bradford – which houses a fabrication and heavy machining shop. Last year it produced 277 bespoke motors, contributing to an annual turnover of more than £11 million.

In 2004 the company was acquired by ATB Group, a leading global supplier of drive systems and motors for industrial applications and home appliances, to expand its capabilities for project motors. (ATB Group was subsequently acquired by Wolong in 2011).

"Our business is about producing bespoke solutions for demanding applications," explains Needham, who joined ATB Morley in 2013, bringing with him 30 years' experience in mining production and supplier roles. *"Every motor we manufacture is tailor-made for its purpose and we are led by what our customers want. We don't go to customers with a product to sell. We don't exhibit at trade shows. We don't even have a product brochure as such - although I suspect my job would probably be much easier if we did!"*

ATB Morley subsequently acquired the companies formerly known as David McClure and Vlasto, Clark & Watson, adding motors and control equipment for marine and defence applications to its varied product portfolio.

A PASSION FOR INNOVATION

The company's in-depth knowledge of the industries it serves places it at the forefront of technological innovation. This is clearly demonstrated by one of its recent successes - the design and manufacture of the world's first flameproof 11kV motor.

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The majority of high production coal mining has previously been 3.3kV which gives rise to limits on power in order to restrict the operating currents and avoid high capacity electrical switchgear to provide the operating currents required. There has previously been a general reluctance from mines to use higher voltages underground. However, ATB Morley can rightly claim to have driven flameproof motors into a new era by equipping the new Armoured Face Conveyor (AFC) at the Blakefield South longwall mine in Australia.

Blakefield South is part of Xstrata Coal's Bulga complex which produces approximately 10 million tonnes of semi soft coking and thermal coal per year primarily for export into Japan. ATB Morley has supplied 2 x 1600kW IMW115 motors to power the mine's AFC, which is described by Xstrata as "the world's most powerful AFC". The 400m face has a maximum extraction height of 3.7m and a panel length of around 3.5km.

Installing the high voltage motors enabled Xstrata to realise a number of benefits, some more obvious than others. For example, the increased power of the AFC has increased production at the site. Furthermore, because the motors facilitate the use of longer AFC and faces, roadway driveage is reduced. But there are other benefits, too. The motors are equipped with a large range of temperature and vibration sensors giving remote feedback to operators and advanced warning of any mechanical problems. This reduces the need for personnel to be in the higher risk areas, increasing safety at the mine.

Leading the drive for energy efficiency

Like any company operating in today's environmentally-enlightened times, finding ways to reduce energy consumption is a prime focus for ATB Morley. In fact, Needham goes as far as describing the company as a "leading player in energy efficiency" - although he admits it was not something that the company initially set out to achieve.

"Because we specialise in the ETO and MTO business, we were a leading player in energy efficiency long before it was on the political agenda. For us, it wasn't a conscious effort to become a more environmentally-friendly business – it was driven by the need to extract more and more power from smaller and smaller motors. Our excellent engineering team have always looked to maximise the efficiency of motors and often our machines offer a significant cost saving for customers due to reduced energy consumption."

The importance of producing motors that consume less energy cannot be over-stated, as Needham is quick to point out. *"It has been estimated that electric motors account for about 65% of the electricity consumed in industrial applications. Imagine if those motors could be made to run 3% more efficiently. Imagine what impact that would have on global energy consumption."*

ATB Morley is now looking to harness this energy saving know-how to help organisations in other industries to improve the reliability and productivity of their systems, and to significantly reduce energy consumption.

ACHIEVING EXCELLENCE IN THE RETROFITTING BUSINESS

With 100 years of engineering excellence under its belt it is no surprise that ATB Morley has established itself as major player in the retrofit industry.

In times of economic uncertainty it can be tempting for companies to pull back from investing in new equipment. However, the argument for investing in new equipment is compelling. The improved performance and energy efficiency offered by latest generation motors means that organisations can often recoup their initial investment in a relatively short space of time, making it far more cost effective to upgrade motors and generators than to refurbish existing kit.

Morley's prides itself on making the whole retrofit process as quick and painless – not to mention cost-effective - as possible.

ATB Morley has undertaken a number of successful retrofits for companies in a diverse range of industries. Customers include water companies, power stations, dockyards and numerous manufacturers. The results speak for themselves – companies report increased reliability, leading to maintained or improved productivity and reduced maintenance costs, and significant energy savings.

Indeed, a recent project involving the replacement of the mill motor at Eggborough Power Station in Goole, Yorkshire, resulted in a 12kW saving, reducing electricity costs at the site by £10,512 (based on the 2014 utility price of @£0.10/kWh).

ATB Morley can provide replacement motors for all applications up to about 2MW. It will replace exactly an obsolete motor, including foot fixing, shaft height, terminal box, even earthing arrangements.

As with all ATB Morley products, every retrofit motor is designed according to the exact specification of the job it is needed for. Furthermore, it is engineered and manufactured in such a way as to ensure quick and problem-free installation, keeping downtime to a minimum.

MAKING WAVES IN TIDAL ENERGY GENERATION

Having built its reputation producing technology for use under the ground, it seems only logical that ATB Morley is now looking under the waves to grow its business.

The marine energy industry is in its infancy compared to the much more established wind energy. However, it is expected to grow significantly over the next two decades. In the UK alone, marine energy is forecast to be worth £6.1 billion to the UK economy by 2035. Marine energy offers several benefits over other types of renewable energy. Unlike the wind, for example, tides are predictable for years to come. Furthermore, tidal turbines, which are installed beneath sea level, are far less visually imposing than wind turbines and are completely carbon free.

In its latest venture, the company supplied a bespoke IX100 induction generator for Wales' first full-scale tidal generator. The DeltaStream device, which is currently being installed in Ramsey Sound, Pembrokeshire, is one of the world's first grid connected freestanding tidal turbines and provides an exciting glimpse into the future of power generation.

The unique design of the generator removes the need for a heat exchanger by allowing direct contact of the outer frame of the machine with seawater. This innovative approach negates the need for a nacelle and vastly reduces the overall cost of the assembly.

The generator is also equipped with thermal monitoring devices and an encoder which allows remote monitoring and feedback from the unit to the onshore control centre.

"It has been estimated that electric motors account for about 65% of the electricity consumed in industrial applications. Imagine if those motors could be made to run 3% more efficiently. Imagine what impact that would have on global energy consumption."

With the unique cooling arrangement for the generator and the unusual freestanding mounting configuration, this turbine has the potential to revolutionise the future of tidal arrays, reducing the required capital investment, allowing projects to become more commercially viable.

The DeltaStream turbine was developed by Tidal Energy Ltd and constructed by Mustang Marine. Tidal Energy received £8 million for the project from the European Regional Development Fund, which was matched by majority shareholder Eco2 Ltd.

Needham believes investment such as this will be vital to establishing tidal energy as a significant energy source in the future. "*In the short term, the kick start is usually provided by Government subsidy, which is then withdrawn over a number of years. The question is whether the Government will put enough into tidal generation to give it the same kick start as it did wind generation."*

"The jury is out on tidal energy but the technology is there to harness it," asserts Needham. "It's just a question of making it cost effective."

With a company like ATB Morley in its corner, the future of tidal energy generation appears to be very bright indeed. ■

ATB Morley has driven flameproof motors into a new era with its introduction of the world's first 11kV motor

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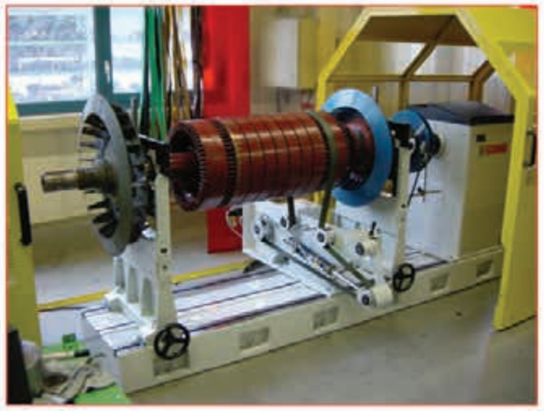

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Matt Fletcher, Managing Director of Fletcher Moorland.

Fletcher Moorland Moving from Strength to Strength

Electro-mechanical engineering specialist Fletcher Moorland has achieved another year of growth across all its divisions, strengthening its team with key appointments and breaking ground with innovative new teams.

During a buoyant 12 months the Stoke-on-Trent-based company – which prides itself on its genuine 24-7 customer service – has won significant contracts for asset management services, while also seeing strong growth in the automotive, food and drink and hi-tech manufacturing sectors.

This has led to an increase in staff at the company including a number of apprentices - recognition that new and young people are needed to help drive forward the business.

Driving the expansion are the company's quality assurance promise to customers and a track record of delivering repair and maintenance solutions to keep businesses moving. Managing Director Matt Fletcher explained: *"Our pledge to customers is that we always offer a solution – and we never leave them with a problem. Our approach, to coin our own phrase, is to use the four R's of maintenance engineering – Repair, Refurbish, Replace and Retrofit.*

"Through this method we are able to guarantee a solution that will satisfy our customers' requirements."

70 YEARS OLD

All this as the family company prepares to celebrate its 70th anniversary next year by continuing to invest in its core business ethos – providing quality work and exceptional customer service.
It was in 1946 that Electrical Engineer Sam Fletcher founded a partnership, Electrical Rewinds and Supplies, to repair and rewind electric motors mainly for industries in North Staffordshire including pottery factories, coal mining, steelworks and tyre manufacturing.

Since then two successive generations, Sam's son Malcolm and grandson Matt, have overseen the company's growth and diversification to become one of the UK's leading players in electro-mechanical and electronics repair and maintenance with a national and international reputation for reliability and innovation.

"My father put great emphasis on looking after his customers and ensuring the work was done to the highest possible quality – a philosophy which has been passed on and which has stood

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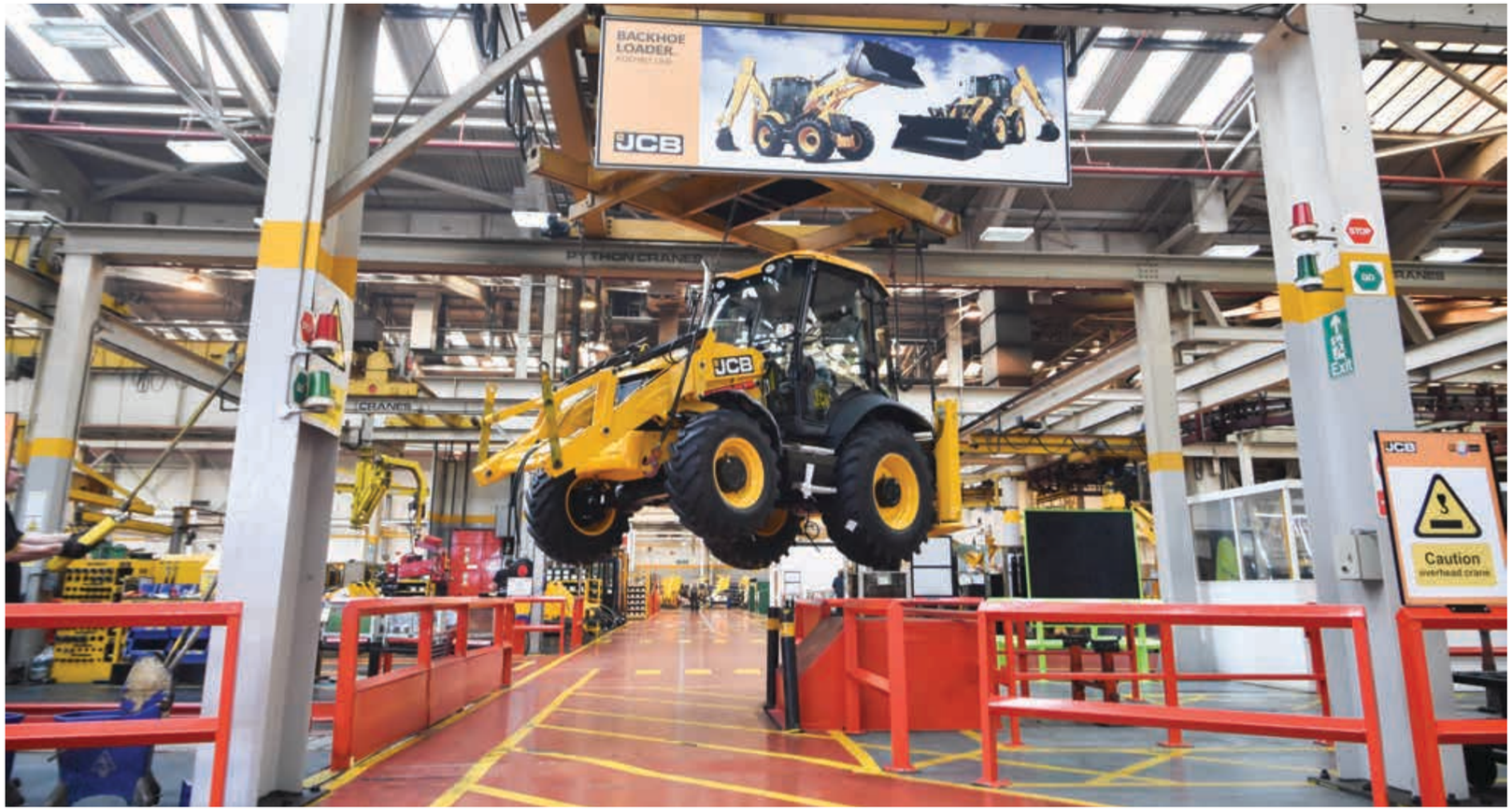

JCB are one company that rely on Fletcher Moorland's reliable services.

>> Continued from p25

the company in good stead over the decades," said Malcolm, who became Managing Director 37 years ago in 1978.

"To keep a business going for 70 years you continually have to adapt and stay ahead of the game – there is no time to rest on the laurels of the past. We have always invested in the very latest technology and developing the skills of our engineers – and this is something we will keep doing going forward.

"We are continuing to expand and find new markets for our specialist skills. Our culture of hard work and customer service is reflected in our commitment to providing a genuine round-the-clock, 365 days a year service."

Never standing still, Fletcher Moorland has continued to invest in equipment and employees to remain at the cutting edge of its field.

SERVO REPAIRS

This is typified by the Servo Repairs Department responding to ever more sophisticated motors, with demands for more complex diagnostics, testing and knowledge of software as well as hardware.

Fletcher Moorland's commitment is simple: repaired servos which leave its workshops will be as good as new... or even better than the day they rolled off the production line.

The Servo Repairs team works with customers from a range of industries and a typical repair can take anything from a day to a few weeks depending on the complexity of the job. Fletcher Moorland's Servo Repairs Team has expertise in the electrical, electronic and mechanical sectors. All three of these skills are needed to offer a true servo motor repairs service. Over 50 per cent of the servo motors the company repairs require mechanical refurbishment such as new shafts, brake overhauls and bearing-fit refurbishments – along with the expected encoder programming and alignment need with modern complex servo motors.

One of the ongoing orders being carried out by the Fletcher Moorland team is the refurbishment of 66 Kawasaki servo motors used in Toyota's paintshop department at Derby to ensure they pass rigorous testing required by the leading car manufacturer.

24/7 REPAIR AND REFURBISHMENT

The company's 24/7 repair and refurbishments team is helping Fletcher Moorland expand its customer base around the UK which will galvanise its position as one of the leading industrial automation specialists.

A Servo Motor being Repaired.

A 23-strong team works on a range of industrial electronic devices including servo drives, inverters, power supplies, DC drives, temperature controllers, PLCs, HMIs and motion controllers.

An impressive customer list includes excavator giant JCB and tyre manufacturer Michelin, as well as many other businesses of all sizes.

Adopting a no-nonsense approach when a repair is required, one of Fletcher Moorland's transport team will be dispatched – whatever the time of day or night – to bring the item back to the company's state-of-the-art workshops. Then a series of tests will be run to diagnose faults before remedial work is carried out. Ageing components and parts are also replaced as a matter of course to help improve longevity and thermal conductive paste used to heat-sync all the components.

All items are then tested with one of more than 1,000 test rigs Fletcher Moorland has on site. These have been specially-designed by the engineering teams to put the full array of parts and components that are repaired through their paces.

Finally the item is transported back to the customer with a 12-month warranty on the work that is done, offering further peace of mind.
Lisa Rowe, Fletcher Moorland's Drives and Controls Production Co-ordinator, said: *"Our 24/7 approach is key to our business and really gives us an advantage. Any down time can be critical to our customers so it can be a case that a 3am call is taken and we have to act fast.*

"When an emergency job comes in it is all hands to the pump to turn it around.

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A PCB being examined.

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To send a same day courier to collect parts needed for an emergency repair whatever the distance is a normal day.

"Our customers really value that commitment because it can save them thousands of pounds in downtime. They respect the level of service and the experience we can bring to any repair or refurbishment."

PRINTED CIRCUIT BOARDS

Meanwhile, research and development experts at Fletcher Moorland are using PCB design and manufacturing to save customers thousands of pounds on their machinery and equipment bills.

Having obsolete PCBs in control equipment is never an ideal situation to be in when you are responsible for keeping production machinery running.

That is why Fletcher Moorland has set-up a specialist division to manufacture PCBs using the original obsolete ones as templates.

This can generate a massive cost saving benefit for customers – who don't have to buy new machines when an outdated and faulty PCB needs repairing.

Ken McCleaft, Head of the Research and Development Division, said: *"We deal with a whole range of customers from the Ministry of Defence to mining and transportation companies and small engineering firms.*

"The process we employ means that even though a PCB may be classed as obsolete we can rebuild it from scratch and therefore save the customer a big bill in buying new machinery.

"They can then go on for years to come, operating the equipment and giving them even better value for money."

As well as recruiting apprentices to its own busy team, Fletcher Moorland is now offering apprentice training to customers to help them with frontline fault finding on electric motors and inverters. The skills being taught are not generally covered in mainstream apprentice training.

Designed to meet the specific needs of each client, they can send their staff to Stoke-on-Trent for the training which covers AC and DC motor theory, inverter operation, practical use, set up, strip down and diagnostic testing.

In a new business development, Fletcher Moorland has also launched a team providing hard-to-find and obsolete spare parts to customers around the world.

The automation spares division will source, stock and supply parts ranging from servo drives and programmable logic controllers to HMIs and servo motors.

The company has already sourced thousands of parts which have been quality tested and, where necessary, refurbished – these are then stored on site at Fletcher Moorland.

SKF CERTIFIED REPAIRER

Fletcher Moorland is one of a handful of UK specialists to be accredited as an SKF Certified Rebuilder for the repair of industrial electric motors.

After passing the rigorous certification process, the company carries the quality mark that guarantees its service, experience and expertise to quickly and effectively diagnose and repair electric motors. The accreditation process included extensive training in electric motor failure analysis, bearing installation, lubrication systems and condition monitoring technologies.

Fletcher Moorland Managing Director Matt Fletcher said: *"It involved a change in workshop procedures and mindsets. Training on best practices and modern repair methods have been given, adapted and created by this certification.*

"We've invested heavily in equipment and our employees are now always looking at all our procedures and methodology to see how we can improve still further.

"The difference to our business has been great; it has made us move from a traditional reactive service to a more proactive service for our customers and we have totally eliminated warranty claims caused by improper bearing fitting.

"Ultimately, the benefits to our business mean we are more able to meet our customers' future needs," he added.

All parts supplied are covered by a 12 month in service warranty – a quality assurance appreciated by a growing number of customers around the world.

GROWTH

As well as domestic markets there is growing demand in Eastern European and emerging markets - another string to Fletcher Moorland's bow in growing the business across diverse operations and markets.

As well as being supported by an experienced and enthusiastic team, the growth plan is backed by the very best facilities. Sustained business growth means there is already contingency planning for a possible move to a bigger site.

Matt Fletcher added: *"Major investments have been made in equipment and infrastructure in our workshops and we always encourage customers to come and see our operation for themselves. It is said we have one of the best workshops of its kind in the world.*

"We have signed up to Google Business View which allows people to take a 360-degree virtual tour of our workshops.

"As our divisions continue to grow we are now looking at how to accommodate that expansion. We have been on this site since 1953 and must soon decide whether to increase the size of our presence here or look to a totally new site.

"As we approach our 70th anniversary, we very much look forward to continuing to offer our renowned 24/7 service to our customers, building on these relationships and forging new ones."

CELEBRATING 70 YEARS

Next year also brings a notable milestone for Malcolm Fletcher – 50 years since he joined the business full-time after completing an apprenticeship at English Electric in Stafford. He was succeeded as MD by his son Matt six years ago.

Fletcher Moorland is planning to mark its 70th birthday by holding a series of events including an open day for customers, staff past-and-present and people who have been associated with the company over the years.

Malcolm added: *"I am very proud that we are still an independent, family-run business with the third generation at the helm overseeing exciting developments and growth."* ■


The Fletcher Moorland Family.

A FAMILY COMPANY

It really is a family affair at Fletcher Moorland. Husbands and wives, fathers and sons, aunties and nieces, brothers, uncles and even a fiancé and his bride-to-be work hand in hand in roles from management to sales and from accountancy to apprenticeships.

But there is much more to the number of close ties than just sheer coincidence.

Throughout its 70-year history, Fletcher Moorland has always been a family-run business and actively encourages the participation of family members within the workforce.

These values are passed on from one generation to the next – which helps to engender honesty and loyalty and the continuation of the company.

Operations Director Diane Mansell said: *"Fletcher Moorland is no different from most companies – we have an ageing yet skilled workforce. The introduction of family members taking on various roles can help to ensure the longevity of the business within the repairs and service industry.*

"There is truly a family friendly environment throughout Fletcher Moorland. I can speak personally on this subject since I have introduced members of my own family too."

WES Makes Room for a Strong Future

Set up in 1990 by Mike Robinson with the objective of providing the best service, quality and product range to the electrical coil winding industries, WES is now being run by his son, Mark the current Managing Director and a team of 28 staff.

Having grown steadily over the past 25 years the company has recently made the commitment of adding a large extension to their manufacturing and stockholding facility in Telford. It will add new products and provide them scope for new activities and market sectors.

Taking a long term view and outlining plans for some years ahead they are already looking at ways to expand their facilities further. The next stage of expansion will probably be to invest in bespoke high level racking for the stockholding operation. This will free up valuable floor space, which could be used for one or more functions yet to be decided.

This proactive management means they will immediately have space available when needed. The alternative is working the site to full capacity making growth seem harder than it is.

WIDE RANGE OF PRODUCTS

WES' product range includes over 70 different types of varnishes and resins; potting compounds; insulating papers and films; high and low voltage cables; electrical sleeving; high voltage insulations; woven tapes; rigid laminates, adhesive tapes; sectional copper wire; covered conductors and slot insulation. As a matter of policy they have always represented the best in class manufacturers for their key products, so their catalogues include entries for producers such as ELANTAS Insulation, Isovolta for insulation, laminates and composites, Omerin for cables and sleeving, h-old electrical adhesive tapes.

A major part of WES's service provision is based on having extensive stocks of a wide range of products combined with reliable deliveries, including 24 hour turnaround if required.

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Their range of materials is constantly growing and evolving so that they can offer an ever-widening selection of stock products. WES' aim is to stay at the leading edge of new product developments for all applications.

A comprehensive product range can only go so far in helping a distribution business succeed though; the supporting services are also critically important. Having realised pretty quickly that if they are going to sell the amount of varnishes and resins they do then having their own laboratory would make perfect sense. It is good for customers to know that if they purchase their varnishes or resins from WES, they would have a UK based laboratory on hand to help them monitor the condition of their tanks. Simply put, if you buy varnish from WES you will never need to test your own material again!

STRIP DIVISION

Recognising a need in the conductors market, in 2008 WES took a momentous decision that was intended to help define the long-term strategic development of the company. It decided to found a manufacturing operation to complement its distribution business (see AEMT Journal Volume 9 Issue 2) Having built up considerable expertise in the technical aspects of their products they were in the position to offer excellent advice, and to hone the supply and delivery operations to a high level.

The next step was to make the deliveries even faster and more reliable. With some of their products they could achieve this by strengthening their relationship with overseas manufacturers or by holding more stock. However, for covered conductor products WES knew that if they were to take it to the next level, they would need to start manufacturing in the UK.

The WES Strip Division was formed in September 2008 and quickly built a reputation for being able to supply customers with a range of covered conductor products, often made to bespoke specification and always to the very highest quality in timeframes that had not previously been possible.

After careful analysis of the needs of the market they decided to develop a production plant based around Ridgeway insulating machines, with a Konform production line and taping capabilities. Enabling them to offer Nomex®, mica, Kapton, paper, polyester film covered copper, all of which are manufactured to order and delivered as the customer needs them.

In the years since then the Strip Division has seen rapid growth and has built an enviable reputation within the market. Today WES produces conductors to EN13601, the latest International Standard which has superseded BS1432, to any size between 5.00mm2 and 50mm2.

It can also source and supply polyester enamel strips from a vast array of European companies, many of whom have formal partner agreements with WES.

The company ethos has been evident in the manufacturing operation since the beginning. The real added value comes from the people; with their dedication to customer service and a right-first-time attitude. On top of this, WES are committed to using the best machinery.

APPRENTICESHIPS

Part of the way the company's senior management builds and maintains its ethos is by growing its team from seed.

Taking on apprentices and putting them through each department for a few weeks or months means they get a well-rounded understanding of the company. Ultimately, they will understand all the company's processes and activities and are thoroughly imbued with the quality standards and how the WES likes to do business. Naturally the apprentices then want to settle down in the area they like the best.

This system helps WES to create exactly the type of workforce they require, and it also means they tend to recruit local people. Being as involved as possible with their community means using local suppliers and trades people wherever possible, and in turn supports local shops, businesses and schools too.

As well as supporting the local community, Mark and WES extend their corporate responsibility into the environmental arena. For instance all metal, card and paper waste is recycled and all the rest is collected for use as biofuel. Further, Mark has just signed off on a £100,000 investment to install a 100kWp photovoltaic array on the roof of the Telford building.

GOING THE EXTRA MILE.

Today manufacturing accounts for about half of the company's £5.5m income and is the perfect complement to the distribution business. The philosophy of always being ready to go the extra mile for a customer pervades both sides of the company.

On the afternoon of 23 December the company took a call from a regular customer in the west of Ireland who run a continuous processing plant and were not planning on shutting down for Christmas. The customer had a pressing need for a particular compound and if they could not get it they stood to lose many days' worth of production, so understandably were very anxious.

A few mouse clicks confirmed that WES had the product in stock, which relieved tensions by a good few degrees. With the customer on hold, options were scoured to get it shipped out to them as soon as possible. However, as each transport option became doubtful, the tension rose. In the end it looked as though they might have to tell their customer that there was no parcel carrier who could guarantee delivery of hazardous material within 24 hours. With customer service a priority though, WES would deliver the product personally.

With the order packed up, and ferry times checked – the straws were drawn.

As MD of the company, it was Mark who ended up on an overnight sea crossing, a dash across Ireland and back again home just in time for him to get home to his family for Christmas. A true accolade of the lengths WES will go to for customer service. ■

Rendered CAD image of the machine as designed by Rotary.

Rotary's New Coil Spreader Promotes a Stylish New Design Language.

A new coil spreader from Rotary has brought a plethora of new design features to the market. Including mechanical solutions that greatly enhance the product as well as elegant aesthetics.

When the AEMT visited Rotary last February, we were excited to see the new machine in person. The new design, which features several technical improvements, really stands out as a beautifully designed object.

HISTORY

On the last visit to Rotary in 2011, we witnessed a business who were comfortably climbing out of the recession with a new Sheffield workshop. They had a strong business portfolio with three key areas to their business; magnets, renewable energy and the OEM workshop equipment. Now 4 years on some changes have happened and they are still growing stronger than ever.

In 2014 the directors took the decision to move away from the renewable sector and focus on the core magnet and OEM side of the business. In 2015 there is a renewed emphasis on developing OEM workshop equipment with resources fully committed to achieving new objectives.

ELECTROMAGNETS

Rotary Engineering incorporates the "Burnand" name and the legacy of over 100 years as a market leader in electromagnets. The Sheffield facility has the functionality to design, manufacture and repair all aspects of industrial electromagnets. The service includes testing, drying out, rewinding and mechanical repairs to all types of electromagnet. The Rotary team of magnet engineers are able to supply and maintain the complete package of equipment on-site including the magnet control equipment, transformers, cable drums, generators, batteries etc. All magnets are LOLER tested prior to despatch, this ensures that customers meet their legal requirements for lifting equipment. The test certifies the Safe Working Load (SWL) of the magnet, which can be up to 40 tonnes in some cases. Rotary are proud that some members of the magnet team have over 40 years' service and this wealth of experience is highly valued, particularly by the apprentices following in their footsteps.

WORKSHOP EQUIPMENT

Rotary's engineers also help with the design or redesign of complete motor rewind and repair workshops and supply the full range of equipment required. Supplying specialist motor repair equipment for stripping down motors, to coil manufacture and varnish dip tanks. Another area they concentrate on is traction workshop equipment from CAM Innovation, who

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Above: Old machine next door to new machine at the Sheffield Headquarters.

have an extensive range of specialist machines. In total they have a very comprehensive package to enable a workshop to improve its efficiency.

NEW DESIGN LANGUAGE

With their fingers on the button, Rotary were able to understand that change was needed in the OEM market. "All over the world engineers are getting more visits from customers interested in the repair process and in coil manufacturing. Workshop tours are commonplace now. The workshop equipment is key to attracting business; if it looks clean, modern and slick – you can go a long way in impressing the customer by demonstrating you have invested in high quality machines" explains Simon Swallow, Engineering Director at Rotary.

With this in mind, Rotary approached Fripp Industrial Designers with a brief to develop a new design language that can be incorporated into all new models being developed by Rotary.

Their flagship piece would be their Coil Spreader range. The brief was clear from the start; not just to update the aesthetics, but to also improve the functionality and construction as well.

Work started with research, the foundations for any project. Fripp did several visits to Rotary and heard from clients in the field who have been operating their coil spreaders for many years. Meetings with Rotary engineers involved mind mapping a design language from the very basics to the final concept creations in 3D CAD programs.

A very smart and ingenious design specification was developed. The clever thing about the design, is the aesthetics parts of it – the colour scheme, the curve of the frame – all highlight to engineers the brilliance of the upgrade. A curved form is far stronger than sharp right angles used in older models. Using black in the colour scheme to make structural parts 'invisible'; or yellow to highlight the operating parts of the machine, and red for the measuring gauges. The bright blue powder coated finish highlights the curves and aesthetics, but is also much more durable to the old hammerite finish and easy to keep clean. A stronger machine with more extensive use of linear bearings and larger cylinders all contribute to making a better coil.

COIL SPREADER FEATURES

Typically the coil spreader is designed for creating high quality diamond coils, found in high voltage machines. The machine uses powerful Norgen pneumatic rams to gently spread the coils. Operators will set the dimensions of the coil using clearly visible yellow calibration devices. The curved frame means that extra force can be used with no twisting of the machine's frame, due to the rigidity of the design, leading to superb accuracy time after time. Linear bearing slides provide much smoother, accurate movements of the machine. Square swivel bars mean the

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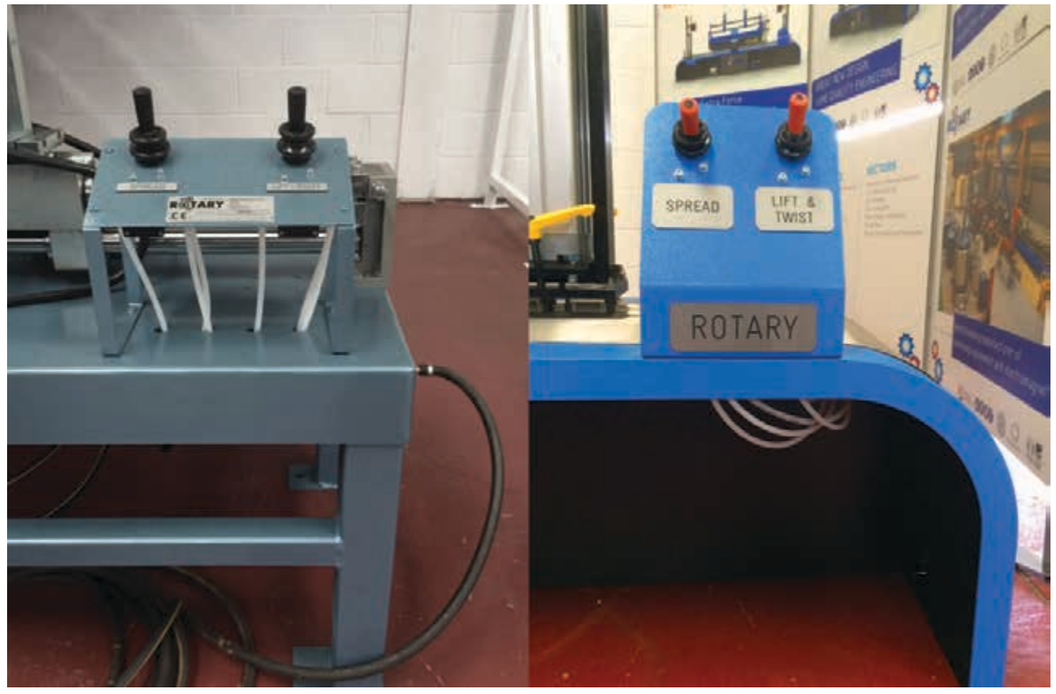
"The workshop equipment is key to attracting business; if it looks clean, modern and slick – you can go a long way in impressing the customer by demonstrating you have invested in high quality machines..."



Old vs New – Control Panel

Simon Swallow from Rotary shows Tim Marks from AEMT features of the new machine.

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spreading rams are held fast, whereas in older designs, a round swivel bar could lead to wear over time.

The improved ergonomics of the machine will mean engineers will have less work to do when working the coils, and have more time to produce high quality, accurately formed coils.

ROTARY WORKSHOPS

With the new design language in place and a show-stopping machine to show off, Rotary are leading the way to new exciting workshops. Designs are already in place to upgrade the whole of the product range and Rotary has already won orders for Coil Spreaders, Coil Presses, Loopers and De-reelers all featuring this new exciting design language and improved performance.

The question is, who will be the first with a brand new, cutting edge Rotary Equipment Workshop?

If you require more information about the new range of machines please get in touch with Simon Swallow and arrange to visit their headquarters in Sheffield.

Do take the opportunity to visit their website where Rotary have been great at uploading working videos of all their equipment. www.rotary.co.uk

The 'Bat Wings' on the new design provide a far more rigid frame.

The Growing Use of the Internet in the "Smart Factory" For Production & Maintenance.

Most engineers know from first-hand experience how important data processing power has become on factory floors and in the offices that support them. It's a trend that is likely to continue for many years and is already encouraging mechanical and electrical engineers to rethink how they design or upgrade plant and machinery. An Association of Electrical and Mechanical Trades seminar with presentations by Alex Broadley and Greg Kilbride of Siemens DF&PD (Digital Factory & Process Industries and Drives) looked at the issues that are arising.

The concept of 'Industry 4.0' has been around for about three years. It is the integration of industrial machines with the internet and should allow the collection of massive amounts of operational data. This can be analysed instantly and compared with incoming orders, sales forecasts, data from other production location, and sensors used to monitor the health of the machinery. This will all help to ensure reliable production and provide information for planning.

Industry 4.0 either incorporates or is closely related to other ideas including: the Internet of Things, the Internet of Services, Machine to Machine communications (M2Mcomms), cyber-physical systems and Smart Manufacturing. At a basic level, they all mean the same thing: connecting production plant and machinery over the internet so that they can swap live data and thus optimise performance. In fact the technology already exists; the issue is achieving the integration, standardisation and security required at each level.

It is inevitable in competitive industries that the productivity of plant and machines must constantly improve in order to reach higher rates of efficiency at the lowest possible cost. The next stage of manufacturing – smart factories and Industry 4.0 – is already beginning to take root. These can be described as self-organizing communities of machines, driven by information generated via the internet.

At first glance this may appear of significance only to control engineers, but in fact it will also involve their electrical, mechanical, plant, production and maintenance colleagues.

For instance, drive systems technology (including inverters, motors, gearboxes, clutches, bearings, lubrication, etc.) will have to integrate with the entire environment of the production process. Data will be collected on oil temperature, running hours, load variations, production output, vibration, idle time, etc., shared around, analysed and acted upon in order to constantly re-optimise production across the machine, the entire site and even with remote sites far away.

Fully integrated drive systems turn individual machine components into subsystems that pave the way to the future of manufacturing. They help improve the productivity, efficiency and international competitiveness of industrial production, and reduce time to market and time to profit considerably.

Alex Broadley explains Siemens' approach to this development: *"There are three axes of integration.*

"The first is ensuring that all the physical components in the drive system integrate seamlessly. This may best be done by sourcing all components from a single manufacturer, or that they at least all comply with a matched set of relevant International Standards.

"Number two is matching the drive system into the totality of the automation system, from the shop floor level right up to the Manufacturing Execution System (MES) used by the highest level of company executive.

"The third axis is 'lifecycle integration', which embraces software and services for all project steps from planning, design and engineering through to operation, maintenance and subsequent upgrades and modernisations."

Siemens combines these steps into a tool called Totally Integrated Automation, which enables the user to quickly and efficiently build his automated system. In simple terms you type in your motor type, this pulls all the motor data though. You then select your drive, drag the icon across and the two become connected. As a tool it is estimated to save around 30% in engineering time and is well received by all who use it.

Alex's colleague Greg Kilbride goes on to say that this will improve productivity, reduce maintenance and downtime,

One of the most common gains associated with fully integrated systems is a significant reduction in energy bills...

and extend the operating life of the machinery. Furthermore, they are able to quantify the added value that is attainable over the life of a machine by computer modelling its performance over time.

While each case will be unique, typical improvements are often along the lines of a massive 30% cut in engineering time to design and build a machine, and a 15–30% reduction in maintenance over the life of a machine. The loss of production and monetary costs associated with upgrades, re-engineering and rebuilding could also be reduced by 20% or more. Let us now look at the potential gains from each of the three axes of integration in more detail.

DRIVE SYSTEM INTEGRATION:

If the mechanical components are perfectly matched to one another there will be a significant reduction in interface losses including vibration, noise and resonance. This will lead to less wear, fewer breakdowns as well as improving the transmission efficiency.

Significant discounts can be won by purchasing all components from a single vendor – who will probably also provide greater levels of support and service during the design, commissioning and operational stages.

Perhaps most useful of all is the avoidance of buck passing, finger pointing and blame avoidance that can blight a multivendor solution.

Totally integrated automation: An integrated drive system is highly efficient within itself, but for maximum productivity it has to be used optimally within the automated production processes. This can include, for instance: not leaving motors running unnecessarily, but switching down to an idling speed or even off altogether whenever appropriate; running motors at an optimal speed for energy efficiency, reduced mechanical wear and minimal electrical losses.

A totally integrated system would collect and use data from many sensors and also compare it with current and projected production. One of the most common gains associated with fully integrated systems is a significant reduction in energy bills; another is reduced maintenance and breakdowns.

LIFECYCLE INTEGRATION:

Thinking about scrapping a machine and replacing it with something more modern, or working out if a product's market life is likely to be shorter than the life of its production machinery, are elements of lifecycle integration. By thinking proactively about how a machine will be used and how it will need to be upgraded after some years of operation will help design out potential problems that could otherwise compromise productivity massively.

Fortunately, many automation companies, including Siemens, have a range of software products that enable optimised planning and engineering, or simulate operations in order to identify potential issues before they become problems, or provide the data by which preventive maintenance can be optimised. Significantly, these programs usually come with all the expert help required and the bottom line is that they are likely to reduce maintenance costs by 15% and energy consumption by up to 40%.

Greg sums up: *"Industry 4.0 may seem a bit pie in the sky to the average plant or maintenance engineer, but in fact it is really only ensuring that we use current technologies to their best advantage. It may require a few extra sensors, but having a computer constantly monitoring every aspect of production machinery and helping with the decision-making has got to be a good thing!"* ■

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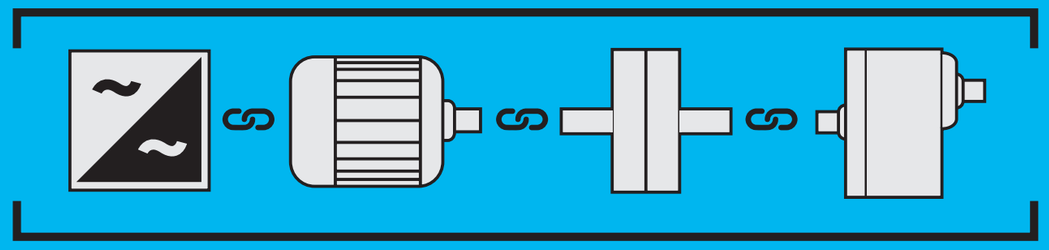
Siemens' Three Axes of Drive Integration.

Perfectly matching components



Horizontal integration

The core elements of Siemens' fully integrated drive portfolio are frequency convertors, motors, couplings, and gear units - all available from a single source. For all power and performance classes. As standard solutions or fully customised. No other player in the market can offer a comparable portfolio.

Your benefits

- Unrivaled portfolio from a single source.
- Ensured drive train compatibility.
- Reliable system performance.
- Optimised components and ideally tuned drive train for productivity and efficiency gains.
- Energy efficiency along the drive train.

Seamless integration into automation

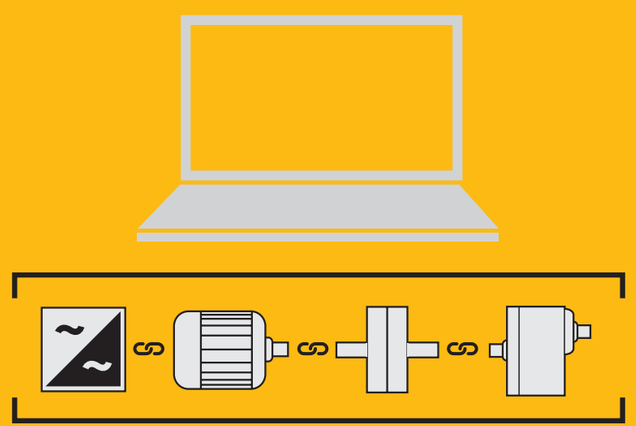
Vertical integration

Thanks to vertical integration with Totally Integrated Automation (TIA), the whole drive train is seamlessly integrated in the entire automation environment - from the field level to controller level and up to MES. This is an important prerequisite for production with maximal value added. Integrated Drive Systems are part of TIA, which means that they are perfectly embedded into the system architecture of the entire industrial production process. This enables optimal processes through maximum communication and control.

Your benefits

- Drive train as an integrated part of Totally Integrated Automation (TIA).
- Highest possible engineering efficiency thanks to integration into Totally Integrated Automation Portal (TIA Portal).
- Intelligent monitoring and control.
- Perfectly interacting automation system components including control, sensors, HMI, and communication.

Covering every step of the lifecycle



Lifestyle integration

Comprehensive software tools from Siemens PLM software are available for all lifecycle phases of an Integrated Drive System - complemented by individual service packages based on the entire technical product information, such as condition monitoring, preventive maintenance, spare parts management, and retrofits. That way, important optimisation potential for maximum productivity, increased efficiency, and highest availability can be leveraged throughout the lifecycle - from planning, design, and engineering to operation, maintenance, and all the way to modernisation.

Your benefits

- Optimisation through product and process simulation.
- Configuration software from coupling to control to optimise efficiency.
- Process driven end-to-end enterprise solutions for shorter time to market.
- Ensured machine and plant availability.
- Worldwide service network with Siemens experts available locally everywhere around the globe.
- Reduced lifecycle costs.

3MW Tidal Turbine Drive Train Test Facility

AEMT Members Visit the Offshore Renewable Energy Catapult

Catapult Centres are a network of seven world-leading centres designed to transform the UK's capability for innovation and to help drive future economic growth. They operate from physical centres where the very best of the UK's businesses, scientists and engineers work side by side on late-stage research and development – transforming high potential ideas into new products and services to generate economic growth.

Catapults are not-for-profit, independent physical centres which connect businesses with the UK's research and academic communities.

Earlier this year in March, AEMT members were invited to the Offshore Renewable Energy (ORE) Catapult in Blyth, Northumberland. It was a typical British spring day, with sun, wind and rain all making its presence known; and in Blyth, by the coast, the winds were forming large waves on the surface of the sea.

Tony Ruane of SKF and Stuart Whitfield of Houghton International

Jennie Gordon of MGC Systems Ltd and Kevin Brooks of Siemens.

Arriving at the facility, you pass by several towering wind turbines and all this scenery comes together to remind you how much potential there is for renewable energy around the British Isles.

The agenda for the day was to learn more about how AEMT members can be a part of this initiative, to understand the engineering complexity of building such a colossal test centre and to hear more about the technologies being developed there.

Tony Quinn is the Operations Director and was responsible for managing the £125 million investment programme in the onshore and offshore test facilities. His talk was fascinating – and his enthusiasm for the test centre showed in his eagerness to talk on the subject. There is a potential to derive up to 37GW of clean renewable energy off the coast of the UK, currently we are utilising only a tenth of this, and that still puts us at the forefront of offshore wind and marine development. Given this situation, offshore renewables presents a massive opportunity for the UK economy.

Following Tony, Dr Mark Knos outlined some of the offshore technologies being developed. He is unique in his combination of practical marine engineering knowledge, knowledge of hydrodynamics theory, practical hydrodynamic testing knowledge and experience applying this knowledge to the development of a marine renewable device. Some of the major issues arising from offshore power come from local objections, running power cables, the environmental damage, and servicing and maintaining the units. Because of this and the dynamic nature of waves and the tide, there have been quite a number of attempts to invent power generation units – all of them unique to the other.

Michael Mulroy has successfully bid for, and managed, a number of offshore renewable projects for the ORE Catapult. He currently manages a multi-partner European funded FP7 project on Condition Monitoring along with a range of activities funded from the UK and a variety of other sources. He spoke to members about the innovation and collaboration being achieved at the test centre. He particularly called upon SMEs for support in validating market and technological proposals; development and commercialisation planning; accelerating access to expertise, facilities, partners and customers; and to lever in funding and investment from the public and private sectors. ■

The agenda for the day was to learn more about how AEMT members can be a part of this initiative...

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AEMT President David Hesketh Presenting.

Thomas Marks of AEMT Presenting.

AEMT Members at ORE Catapult, Blyth.

Bob Critchley of AEV with Chris Jordan of Elantas.

New industries help Siemens grow traditional technologies

Siemens DF&PD - Digital Factory & Process Industries and Drives - move to a new Leeds home has allowed it to expand existing operations and develop new customers, particularly in emerging industries such as wind turbines and wave power.

Digital Factory & Process Industries and Drives.

Alex Broadley of Siemens presenting to AEMT Members.

Siemens DF&PD employs 2,000 people in the UK, which represents about one-tenth of its overall UK head count over all its businesses and one-thousandth of its worldwide employee numbers. IA&DT says it is committed to maintaining long term manufacturing in the UK, a claim it confirms through vibrant apprentice and training schemes which are producing the next generation of engineers and managers.

Association of Electrical and Mechanical Trades (AEMT) members were impressed by the facilities and operations when they were given a tour of the site as part of a day-long seminar in April.

The relocation followed Siemens' multi-billion Euro acquisition of global gear maker Flender GmbH. An evaluation of the original Flender UK facility in Bradford found it to be too small and lacking the headroom and large spaces required for the new work such as assembling and refurbishing the drive trains from wind turbines.

The new purpose built facility has 50,000sq ft of clear factory floor space and three times the working height. This has allowed the installation of several overhead cranes – one 50 tonne unit and three of 25 tonnes – which are vital for the safe and efficient movement of the large transmission components and assemblies that characterise the customer industries.

The shop floor includes inspection areas for incoming plant that is to be refurbished, a number of assembly and production cells, heavy duty test equipment, and stores.

"The large clear working area and generous loading bays of this bespoke building mean we can have smooth workflows, which are good for productivity and provide a safe working environment," says Alex Broadley, an engineer who transfered to Siemens with Flender.

Siemens acquired Flender because it realised that the mechanical, electrical and control elements of drive systems would need to become more and more integrated in order to achieve better energy efficiency, reliability and machine life. In fact the level of integration required would only be attainable if all elements were made by the same company. ■

1. *AEMT President, David Hesketh of Bowers Electrical.*
2. *AEMT Secretary Tim Marks with Chris Birks of AEV.*
3. *Siemens presenter Greg Kilbride with John Moody of Anglo Carbon*

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6

4. *Sam and Joe Bennett of Bennett Electrical with Simon Cattell of MKE.*
5. *Chris Robson and Chris Lisle of Houghton International talk to Tony Ruane of SKF*
6. *Ian Baxter of Morgan AM&T with Mike Smith of Anstee & Ware*

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