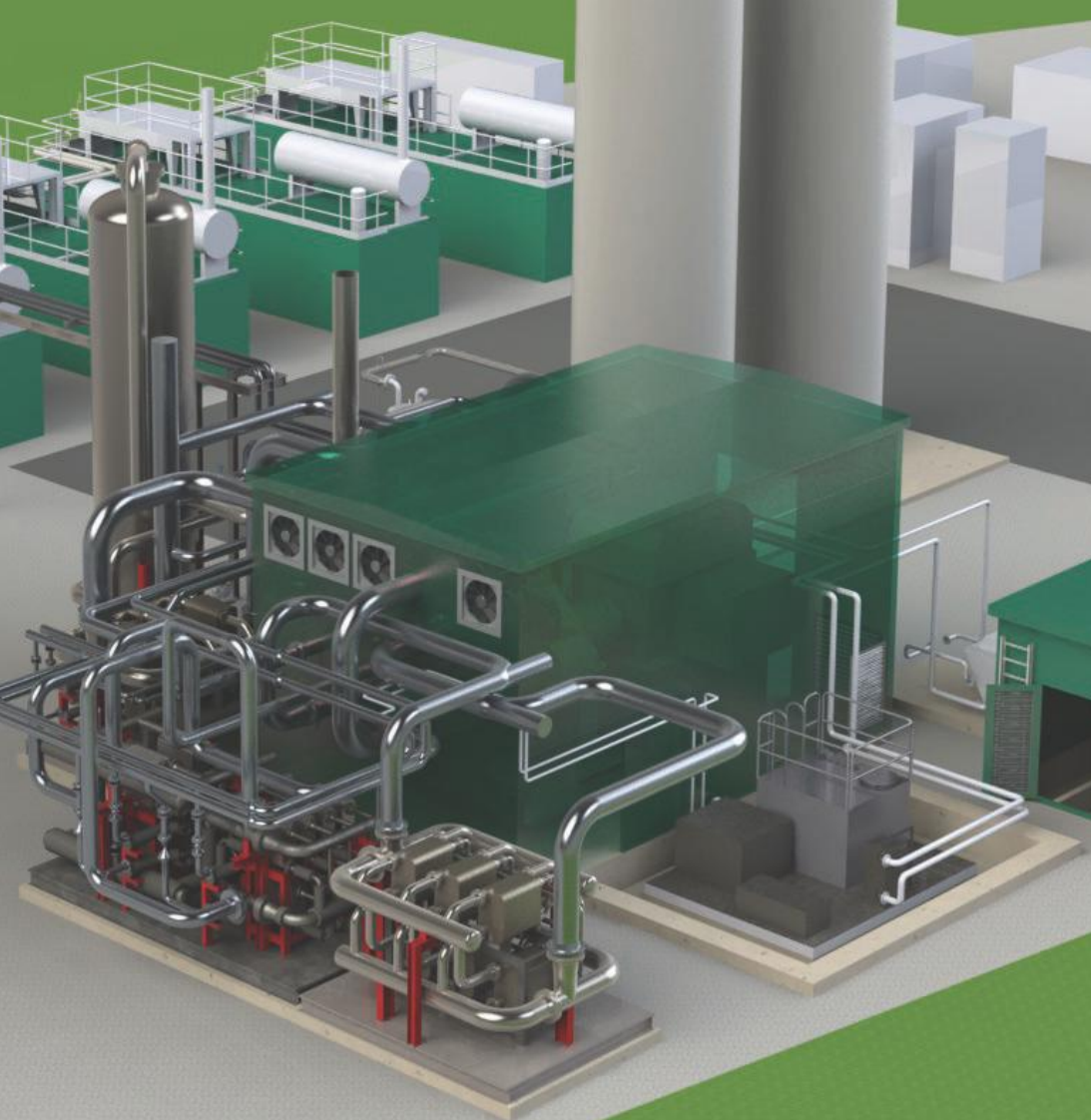


AEMT

Volume 16 Issue 3 [www.theaemt.com](http://www.theaemt.com)

# Journal

ASSOCIATION OF ELECTRICAL AND MECHANICAL TRADES



## INSIDE THIS ISSUE...

World's first liquid air energy storage facility

Brexit at the AEMT conference 2016

Houghton International focusing with 2020 vision

NTN-SNR bearings looks at the aftermarket.

Upgrades to pumping station at Abbey Mills

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# Journal

VOLUME 16 | ISSUE 3

### Front cover photos:

- Liquid Air Energy Storage facility designed by Highview Power Storage
- Latest surface protective coating provides increased service life for rotating equipment
- TGV breaking world speed record at 574km/h using NTN bearings

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## AEMT COMMENT

### Preparing for the future

Much of the world have had their eyes glued to the news channels in 2016 – a significant amount has happened in 12 months!

It has been a tragic year, saying goodbye to many cherished and much loved celebrities, and also to a few less known, but highly regarded engineers such as Jay Wright Forrester awarded the IEEE Medal of Honor (1972) for his work in computer systems and Paul Rosche whose engine designs became notable in BMW’s high-performance cars.

These innovators and pioneers of engineering have left a legacy that has impassioned a new generation to continue in their paths.

The US election and Brexit of the UK from Europe has meant the world has had to latch on to news channels, looking for any direction on what’s to come next. Donald Trump looks set on getting the US back into chugging out carbon heavy fossil fuels. Engineers will be needed in order to revolutionise carbon catching technologies if we are to save the planet at all. An article on a new design to capture energy using liquid air as an energy source is being trialled at Viridor using WEG motors offers some promise for an emission free future.

Upgrades at Abbey Mills Pumping Station have been designed to accommodate the increased storm water storage that the UK is having to now deal with.

An AEMT forum focused on Brexit at the annual conference with the associations deepest concerns looking at how new legislation of ATEX and CE equipment will be managed outside the EU, and also where our labour will come from in future, if not from eastern Europe anymore.

We hope you enjoy this edition of the journal, and as always keep your minds open to stories you would like to see featured in the magazine.

**Thomas Marks**  
*Editor and Marketing Manager*

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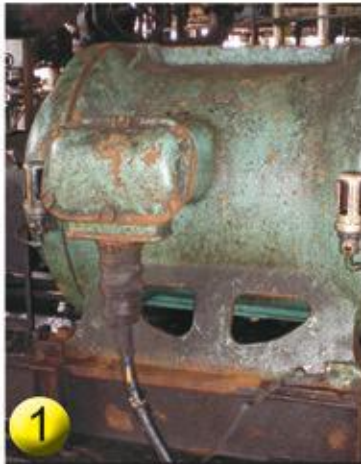


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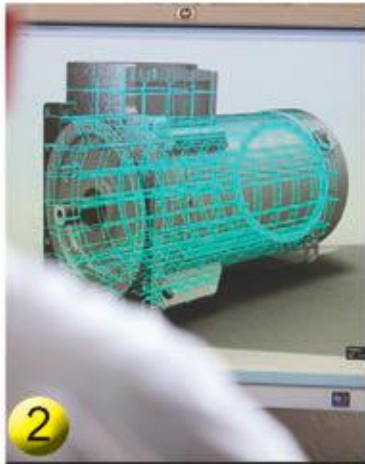
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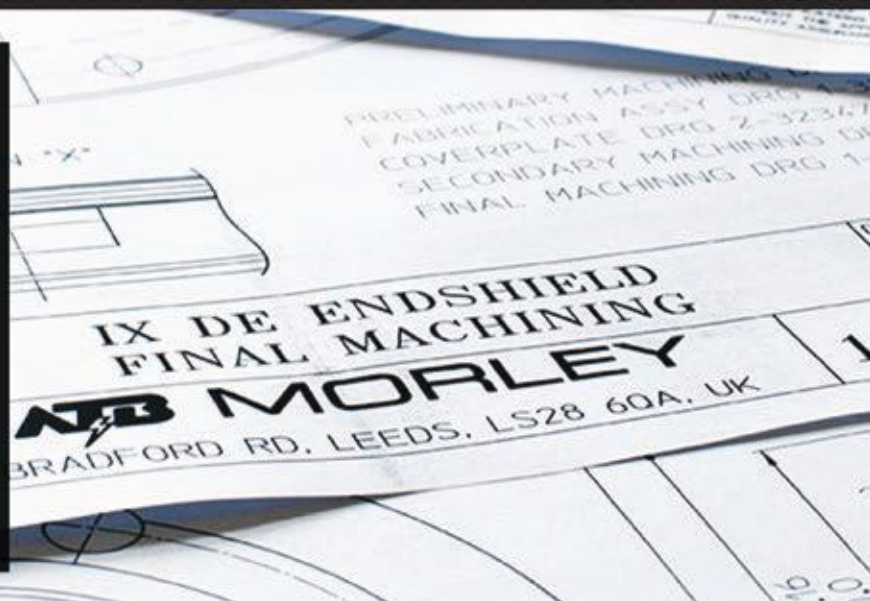
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- Malcolm Grogan, Scottish & Southern Energy

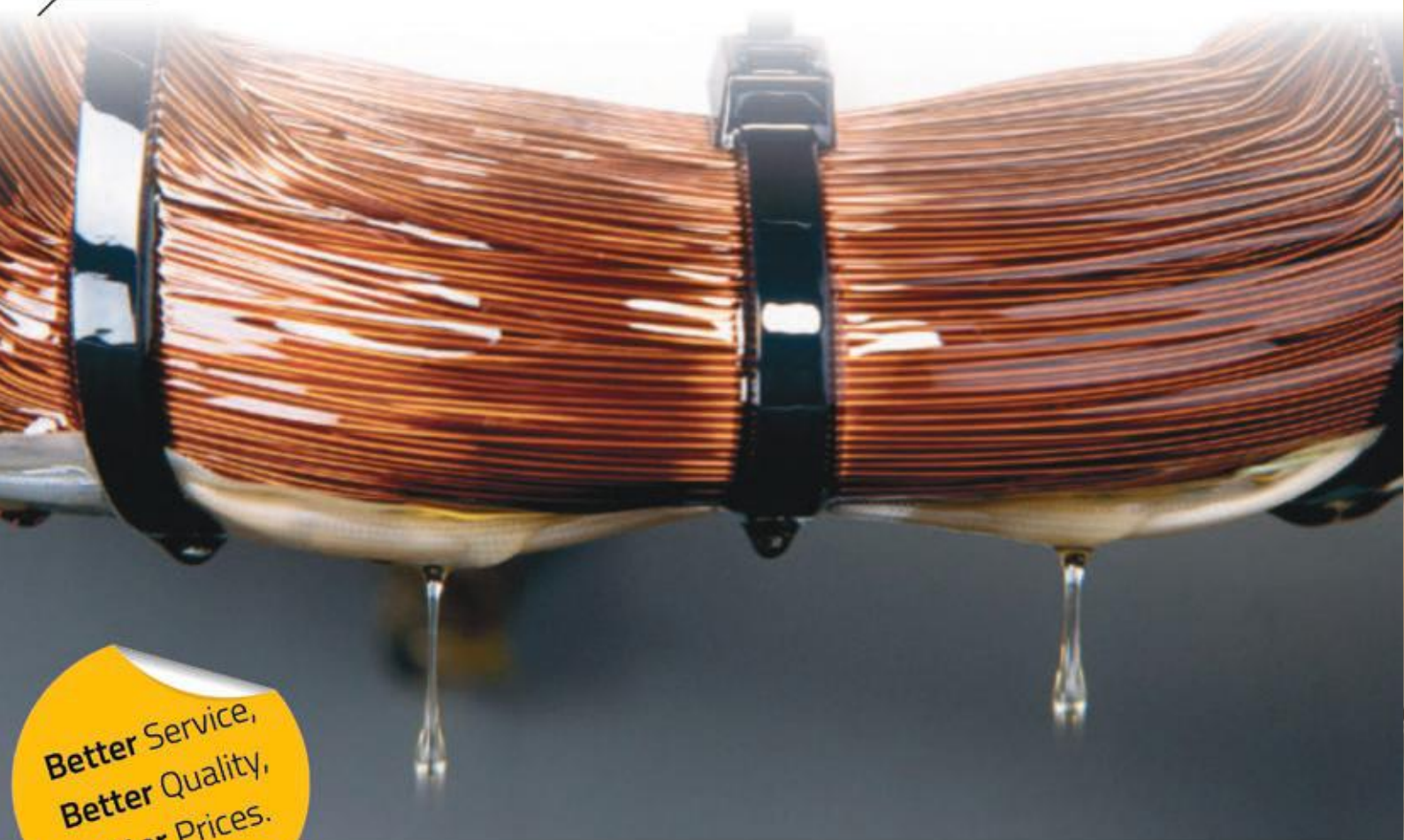
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Michael Mitten, CEO, Houghton International in their new large machine repair shop.

# Houghton International Focusing with 2020 Vision

It is almost 10 years since the AEMT's last article on Houghton International. This was just after Michael Mitten became the CEO of the family company. It is fair to say that the company has expanded considerably in all areas since then, and there are further plans to significantly grow the business between now and 2020 with major investments planned and in the pipeline.

**Their key to successful growth is explained by Michael Mitten as "finding the right mix of experienced operational and support staff. This ensures we continue to deliver the high quality, specialist services that our customers expect from us. We continue to invest in training and apprentices to develop the skills the business needs for the future and its continued growth." With a focus on culture, innovation and product development, supported by a booming order book, Houghton International shows no signs of slowing down anytime soon.**

Their strategic five year plan is called Project 2020. They plan to increase growth in all sectors, both internationally and in the UK. The next stage in the strategy is to increase the international sales team to reach its wider market with a range of specialist high voltage coils, electro mechanical repair and condition monitoring services. Currently they are recruiting a sales representative in North America, which will be followed by other domestic and multinational sales representatives.

The company has welcomed another 10 new recruits to the team in order

to keep up with demand and support further growth. This now brings their staffing levels up to around 100, bolstering their business in a number of key areas. The new recruits include three new apprentices, experienced fitters, additional QSE and HR support, and a number of administration positions. They out grew their original premises, and over the past few years they have added an additional three workshop premises, all in close proximity to their main facility.

Alongside investing in people, Houghton International has also invested over





## Planned maintenance and overhaul of two generators from the Safe Bristolia during docking.

**With increased services and capabilities, new jobs have become available to Houghton International such as the maintenance and overhaul of two generators from the semi-submersible offshore accommodation vessel, Safe Bristolia.**

Site Service Engineers travelled to the docked vessel in Norway to electrically

and mechanically disconnect two generators. They then packaged them up and arranged for them to be transported back to Houghton International in the UK.

A full overhaul was carried out on each of the generators in their fully equipped workshop. The overhauled generators were then packaged and shipped back

to the vessel in Norway with the Site Services Engineers travelling back to site to recommission and install them.

Richard Younger, the Vessel Manager and Chief Engineer at Prosafe, was very pleased with the work carried out. During these projects, he enjoyed “an efficient and reliable service, as well a cost effective solution.” ■

£300k in plant and machinery to improve performance and keep up with demand. This includes new testing equipment, winding kit, and energy efficient ovens, to continue to improve the range of services it offers. Houghton International plans to continue to grow and embrace whatever challenges come its way.

### Where are they now?

The company now operates under three divisions.

EMS: its Electro Mechanical Services division which specialises in the repair, monitoring, maintenance and

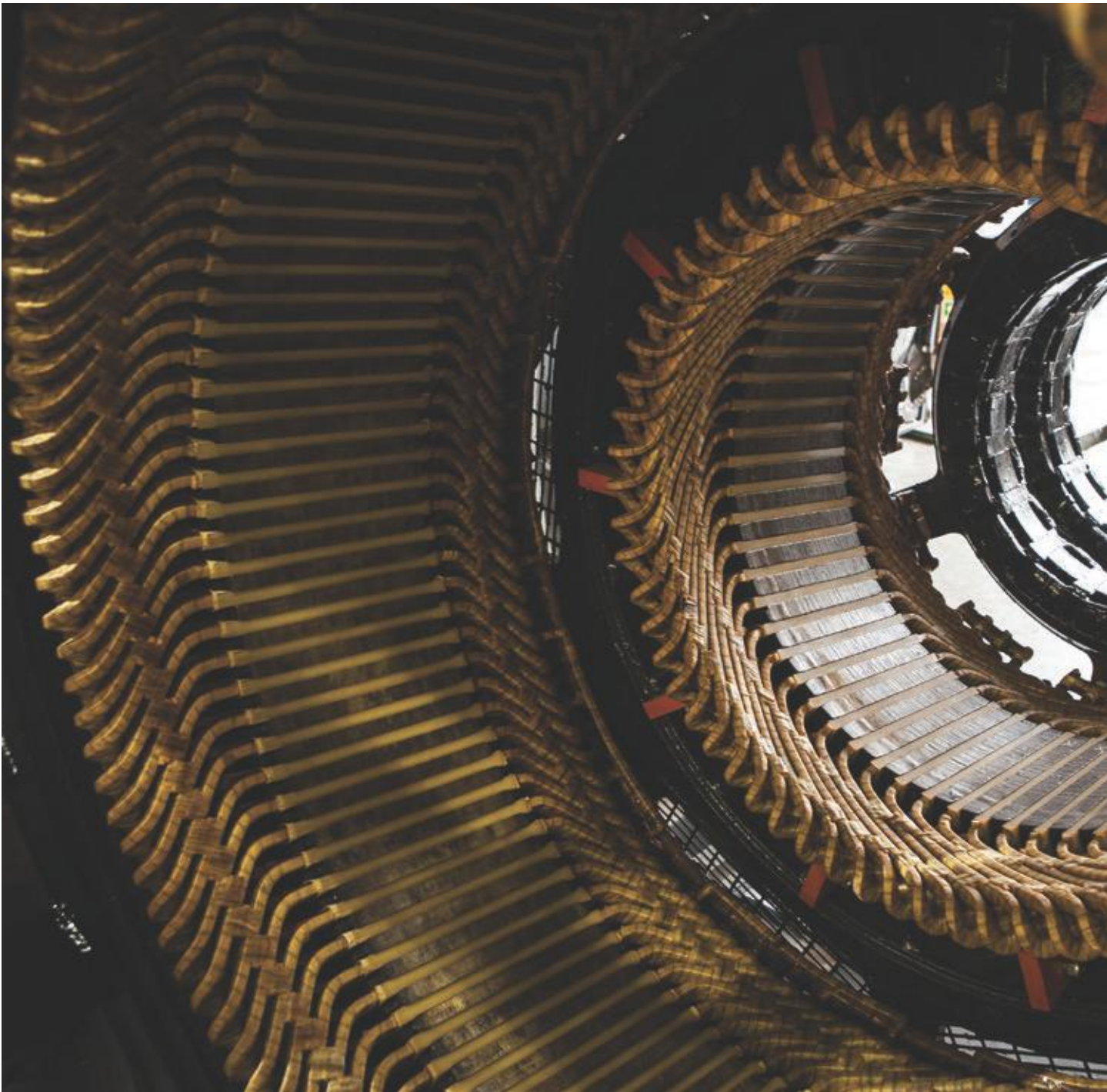
life extension of electrical rotating machines. Condition monitoring and preventative maintenance is a big part of their business now and as technology advances it is fascinating how they continue to develop in this area with both the company and their customers benefiting from the wealth of data and information that becomes available to them.

Rail: a division set up specifically to service the needs of the railway industry to reduce costs and improve reliability by extending the life of their electro-mechanical assets.

HVC: their High Voltage Coil division. As well as supplying their own internal repair shop, it supplies coils and specialist rewind support to other repair companies and AEMT members.

### EMS – From the North East to the North Sea and beyond.

Houghton International's Electro Mechanical Repair shop specialises in electrical rotating machines. Services include mechanical and electrical repairs to a broad range of equipment including AC and DC motors, pumps, gearboxes, generators and turbines.



*Houghton International secured a contract with GWR to overhaul its HST alternators.*

With a diverse range of highly skilled engineers, over the past 10 years the business has expanded to include large repairs and a comprehensive range of site services including condition monitoring and on site rewinds.

To keep up with the needs of the market and in order to remain competitive they realised that customers needed on site services more and more.

In certain industries, it is impractical

to remove the motors and bring them to the workshop for repair. Over the past few years their team has been strengthened by a number of site engineers who can address any issues on site and carry out diagnostics, maintenance and repairs.

Engineers are available 24/7 and carry out a range of services from routine maintenance checks, laser alignment and balancing, to full on site rewinds. They work on a range of sites from

industrial factories down the road, to vessels and rigs in the North Sea, Europe, and beyond. Newcastle is very well connected, meaning workers can be mobilised and on their way within a matter of hours.

In order to serve their customers better and speed up the repair process, Houghton Exchange was developed. An online communications platform that allows the engineers to take live video recordings of the repairs as they go.





*Houghton International coils in a power station diesel generator rewind, Central America*

The videos are then sent to customers to assist with diagnosis, keep them up-to-date with progress, and witness any testing carried out.

### Large machines

This year has also seen Houghton International expand into a fourth operational site, its large machine repair shop, after winning a new multimillion pound contract with Great Western Railway.

## HiFLEX coils for Diesel Generator

**When a customer in Central America required specialist support regarding the rewind of a 23,035kVA / 13,800 volts, 514 RPM diesel generator, Houghton International were able to supply both the coils and engineers at very short notice.**

An engineer was flown out within 48 hours to conduct an on-site inspection and to collect the necessary data for a pre-winding kit to be supplied. This reduced the project time considerably. A set of 168 HiFLEX coils were

manufactured in Newcastle on an emergency service basis with an additional moisture proof epoflex sealing system to take into account the tropical climate.

The HiFLEX coils were delivered on a partial shipment basis to enable work to be started very quickly. A complete winding kit, along with air drying varnish materials, were also supplied to enable the repair to be conducted on site.

Houghton International technicians were there to assist with the winding process resulting in the generator being successfully recommissioned within six weeks of failure. ■

Houghton International noticed a demand for repairs of larger machines. At the time it was not equipped to handle this type of heavy equipment in its existing workshop. Earlier this year they acquired a larger machine repair shop; a 10,000 square foot building with a much higher head room and up to 40 tonne craneage. The new workshop has allowed them to expand their overhaul and testing of large motors and generators, and significantly increased their capacity.

### Looking past the traction motor with Rail services.

When Michael Mitten took over as Managing Director eleven years ago, his first major investment was in equipment to repair rail traction machines, which stretched them to the limit. It was a

bold decision which has paid off big time and now accounts for a significant share of their current turnover. Since then they have gained experience with both AC and DC traction motors, repairing over 4,000 individual traction motors ranging from G310s, EE507s, High Speed Train (HST) motors, both Brush and GEC type, in addition to a broad range of other AC traction motors using their own HiTRAX insulating system designed for optimum performance in rail operating conditions.

### Improving the reliability of Motor Alternator (MA) sets with HiTRANS

In addition to this they have also developed innovative solutions for DC line inductors, HST alternators, and Motor Alternator Sets (MA) for test and repair. These are comprehensively tested

with their unique patented HiTRANS transient dynamic test process, which simulates full load conditions of any type required. HiTRANS replicates exactly what happens in service, meaning that the unit has been tested at full working load before it leaves the facility, significantly reducing the risk of failures in service. In the UK, a rolling stock operating company (ROSCO) owns and maintains the trains and carriages, which are leased out to the Train Operating Companies (TOC's) who operate the trains. Houghton International work closely with these companies and the bogie overhaulers to extend the life of their electro-mechanical assets, which reduces their costs and improves reliability.

In such a safety critical industry, the barriers to entry are high and their



HiTRANS patented full load testing for MA sets

## Abellio's Greater Anglia fleet

One of these Operating Companies, Abellio's Greater Anglia fleet of vehicles, which operate between Norwich and London Liverpool Street, challenged Houghton International to improve the performance and reliability of their Motor Alternator (MA) sets.

Houghton produced a schedule for MA set overhaul and service, which included repairs and rewinds where required as well as HiTRANS testing.

The Technical Engineer of Greater Anglia was so impressed with HiTRANS that he had "absolute confidence that they

could rely on the Houghton's team to diagnose and resolve any issues arising, in a timescale that fitted in with our requirements. Furthermore, when the MA set is returned after overhaul, we are confident that it will run on the vehicle without issue." ■



quality standards are demanding. However Houghton International has been able to overcome all of these issues, and demonstrate that they “have what it takes” to successfully compete with some of the more established competitors.

Their success and expertise has led them on to service other electro mechanical components on the rolling stock by working directly with their customers to understand where problems are occurring, and developing specific solutions to solve them. Their RISAS Certified Rail division now accounts for approximately half of their business and they have secured various contracts running through to 2021.

The rail industry is changing rapidly; fleets are being updated and more lines are being electrified. Houghton International are committed to keeping up to date with new technologies and developments as they happen.

Their aftermarket services have been enhanced by becoming the service partner for the Austrian motor manufacturer Traktionssysteme Austria better known as TSA. TSA produce a range of drive solutions based on asynchronous and permanent magnet technologies in motors and generators as well as a range of gearboxes. Under the exclusive agreement the business will provide service, maintenance and spare parts for all TSA motors and rotating machines in the UK and Ireland, offering local support and specialist repair services.

### High Voltage Coils (HVCs) designed with repairers in mind

Houghton International has also invested heavily in expanding their High Voltage Coil manufacturing department with new equipment and larger premises. They offer a range of resin rich and global VPI insulation systems for industrial, power generation, and hydro applications. They manufacture stator, armature, field and rotor coils for all types of motors and generators, in diamond and concentric coil designs.

They started out exporting coils to one customer in Nigeria. They now

supply to repairers both in the UK and internationally. In the last year alone they have picked up new customers in Australia, Sri Lanka, Venezuela and the Caribbean and now export to over 25 countries worldwide.

The key to Houghton International’s success is its innovative HiFLEX coil insulation system. Unlike standard B-stage resin rich coils, HiFLEX coils aren’t just flexible, they are also fully electrically tested at full test voltages before being dispatched to customers. This guarantees dielectric integrity and eliminates the need to cure and bake after installation. They are ideal for on site or larger rewinds where it is impractical to stove the machine. Most resin rich systems use an uncured B-stage end winding for flexibility, however HiFLEX utilises a fully cured, yet still flexible, resin and mica system.

The HiFLEX coil bars are insulated in a hot-pressed mix of fused, dielectric, thermosetting materials. The bars are then shielded with a layer of anti-corona conductive coating. The overhang coils are also fully insulated with a cured, but flexible electrical insulation tape. This allows the flexibility to manipulate the overhangs during installation, without any detrimental effect on the dielectric quality.

Along with supplying coils to other repair shops, Houghton International also offer bespoke support in high voltage engineering. Technicians are able to assist with specialist rewinds and also support other repair companies by carrying our repair and rewind work on their behalf.

A lot of new work comes from referrals, which has been extremely good for their business, not only because it means that their current customers are happy with the coils they supply, but it also makes it easier for new customers to trust that they are going to deliver what is required.

The company has developed a very flexible approach and highly experienced team. Because they are a repair company they understand what repairers need, and what is important to them. They work with customers to deliver

coils when they need them and to the right specification for the job. They can even help their customers insert the coils if required. The benefits of all of this was demonstrated at a recent Power Station generator rewind in Central America. Houghton International have recently invested in a new AutoCoil design software, which uses the latest technology to offer 3D coil design and slot build drawings. It provides their customer with very high quality 3D coil designs, and impresses the end user when advising them on all aspects of the coil design. It shows every part of the repair has been considered in detail. The company is currently working on other exciting new coil developments, which will soon be available to all of their customers.

### Looking to the next 30 years...

Looking to the future Michael Mitten reflects, “The last 11 years as CEO of Houghton International have been as rewarding as they have been challenging. I have seen our business grow, our people develop, and our culture flourish. We have an exceptional team in place and I’m looking forward to continue servicing the needs of the industry until 2020 and beyond!”

Regardless of the UK’s position in the EU, Houghton International is, and will continue to be, open for business internationally. Nothing has changed yet and its unlikely that it will for at least a few years – “at the moment it is very much business as usual for us” adds Michael.

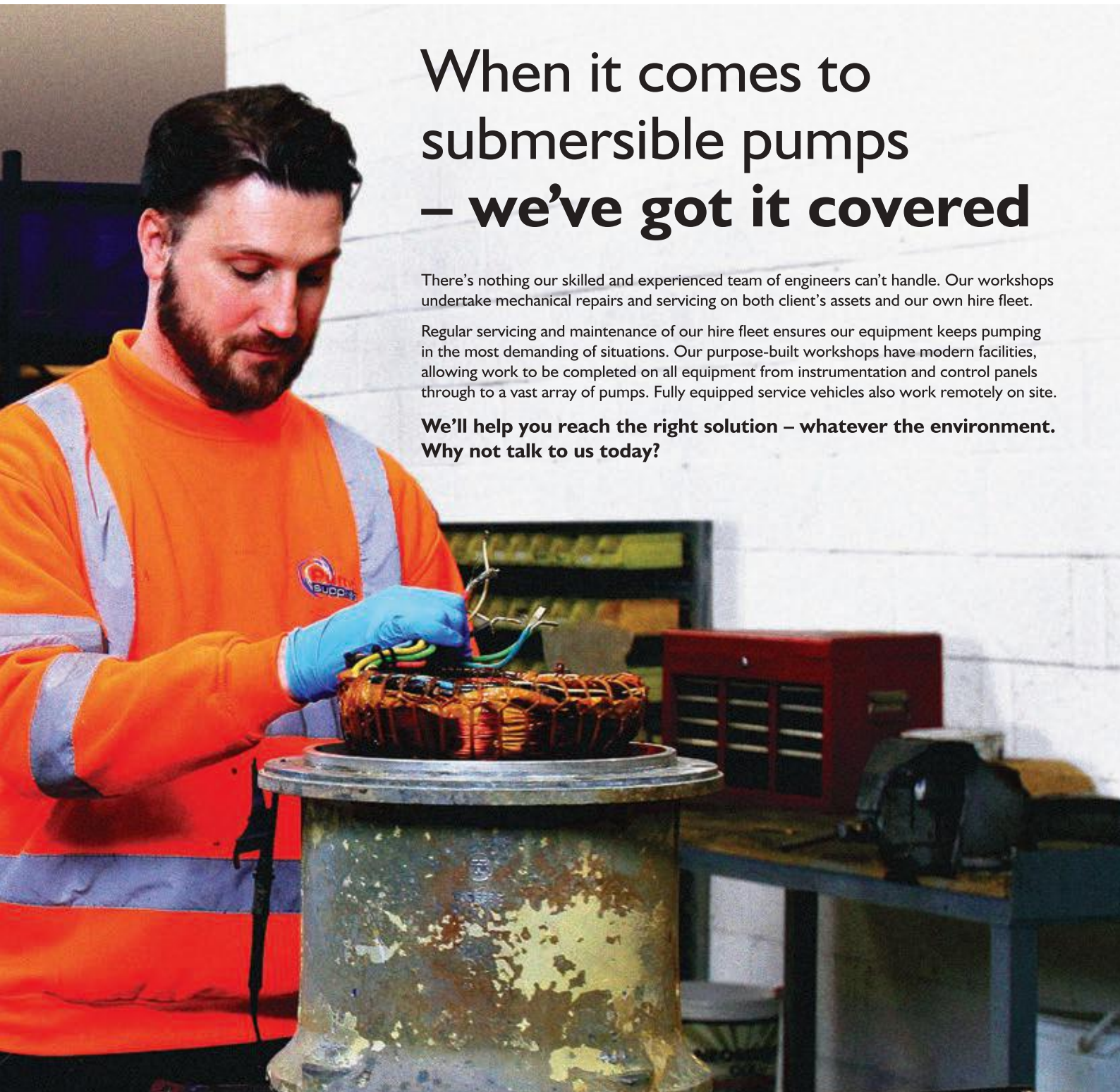
However, as the Prime Minister has very clearly stated, Brexit means Brexit and the company is fully prepared for this. As a medium sized, privately owned business, they are small and agile enough to react to changes. Michael sees “Brexit as an opportunity to improve business with customers in the EU and around the globe”.

Houghton International:  
www.houghton-international.com

The AEMT last wrote about Houghton International in Volume 7 Issue 4. ■



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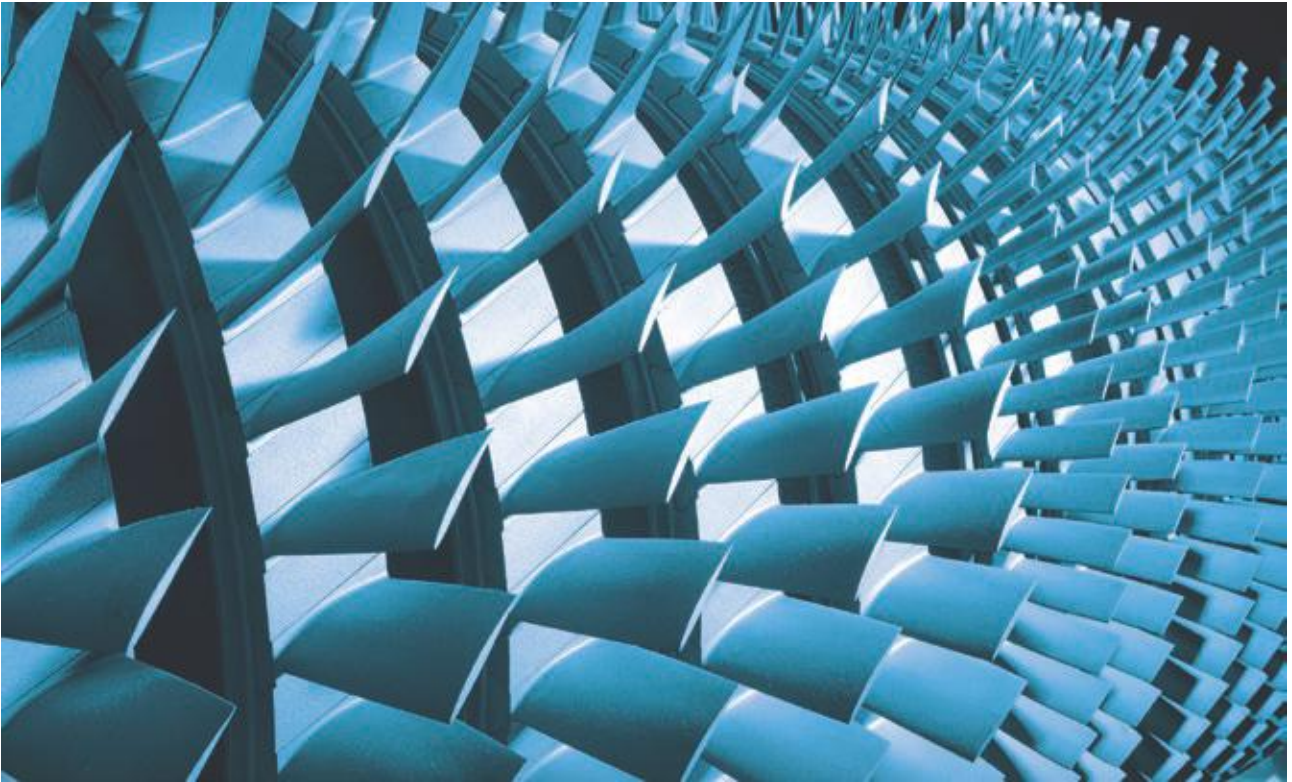
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*Protective coatings help to increase the efficiency and extend the service life of the gas turbine.*

# Customized protective coatings meet the challenge of extending service life for rotating equipment

Achieving an acceptable service life without excessive maintenance can be a challenge for rotating equipment that is used in the processing and delivery of hydrocarbon products. Thanks to the latest surface coating technologies however it is possible to offer massive improvements to the expected service life of compressors, turbines and pumps that are subject to surface oxidation, corrosion, erosion and heat damage.

**Travis Cockrell, Component Superintendent of the Coating Department at Sulzer's Houston Service Center, looks at some surface protection processes and technologies that are now being used to increase the durability of rotating equipment used in demanding operating environments.**

Long-term reliability is a common goal for all plant operators, achieving it requires a considered approach that takes into account a range of contributing factors and makes use of the appropriate technologies and manpower. Rotating equipment that is in direct contact with the process media and under constant attack, presents a major challenge; it is possible however

to reduce degradation to a minimum by selecting the correct coating system.

Generally, turbines, compressors and pumps, are all subject to a variety of environmental conditions that contribute to corrosion, erosion, fouling and various temperature related issues. The first step is to understand the operating environment of the machinery. From



Modern coating technology can now be applied to legacy equipment that was not designed to take account of particulate-laden gas streams

there, the sources of degradation can be classified and specific coating systems can be used to increase efficiencies, lengthen the interval between scheduled maintenance and reduce the occurrence of unscheduled maintenance events.

### Gas turbines example

The flow path of air and fuel through a gas turbine presents a number of different conditions that can have an adverse effect on the performance of the turbine. The combination of heat, microscopic abrasives and a gradually increasing concentration of corrosive elements can cause significant damage to a once smooth airfoil surface. As the surface finish slowly degrades, the

efficiency of both the compressor and turbine is reduced.

### Compressor section

This process can be arrested in the compressor section of the gas turbine, and the surface finish restored, by the application of suitable metallic coatings. There is a range of options open to suit the specific duty of the turbine in question, but all include a type of metal deposition where a tough corrosion resistant surface is created.

An aluminium base layer is typically used in gas turbine compressors for corrosion protection of ferritic/martensitic steel components in moist conditions. It

provides galvanised protection, which means that small scratches to the surface layer are less likely to cause corrosion. It is produced by spraying a slurry of aluminium and an inorganic binder, rendered insoluble by a medium-temperature baking process. This layer can then be covered by a harder layer that might include metals such as Chromium.

The harder layer is usually applied using a spray coating method such as Chemical Vapor Deposition (CVD), Air Plasma Spraying (APS), Low Pressure Plasma Spraying (LPPS) or High Velocity Oxygen Fuel (HVOF) - which one will depend on the coating thickness required and the sensitivity of the part to heat, as some





processes are hotter than others.

By applying corrosion inhibiting and surface finish enhancing coatings to the compressor section, it is possible to increase the efficiency and extend the service life of the gas turbine.

## Hot section

Modern gas turbine hot section components are made using nickel or cobalt based superalloys, which are designed to operate in high temperatures. However, these alloy compositions are less suited to providing corrosion and oxidation protection and need to be supplemented with custom coatings that can deliver the

hot corrosion and oxidation protection required for extended service life.

The process of oxidation causes a layer of metal-oxide to form on the surface, which, in general, protects the underlying material. Therefore, the oxidation process slows down as the thickness of the oxide layer increases. This process can be replicated with the intentional formation of oxides that provide a protective layer preventing further atmospheric attack.

Corrosion of a gas turbine component usually occurs in one of two ways. Hot corrosion may take place between 1450 and 1650 °F and it attacks the entire surface of the component. Alternatively, corrosion at cooler temperatures is more localized and therefore tends to create distinct layers of oxide and exposed metal. Further damage can be caused by erosion which involves repetitive mechanical abrasion by particles in the air stream.

Standalone High Velocity Oxygen Fuel applied MCrAlY coatings (where M=Cobalt and/or Nickel with Chromium, Aluminium and Yttrium) are sufficient to combat corrosion/oxidation at lower firing temperature gas turbines. For newer technology, higher firing temperature gas turbines, the combination of a MCrAlY bond coat coupled with a ceramic thermal barrier coating will reduce the surface temperature of the substrate and reduce the degenerative effects of oxidation and corrosion.

## Compressors

Pumps and compressors account for more than 20 percent of the world's electricity demand and the energy costs to run them represent 95 percent of the running costs. It is therefore essential to minimize these costs by improving performance and efficiency; these efforts will also have a beneficial effect of improving reliability and service life.

While turbines extract energy from a gas expansion process, turbofans and compressors are used to increase the energy of gases. As such, the main issues with these components are corrosion, erosion, and fouling.

Corrosion is defined as a chemical reaction between the component surface and the reacting fluid passing through a turbomachine for example. Many metals form oxide layers that adhere to and passivate the surface to prevent further corrosion, but the change in the physical properties of the surface significantly increases the frictional properties and thus decrease aerodynamic efficiencies; so there is a balance to be struck between protection and efficiency, which is where advanced coatings can help.

Particulate fouling results from the presence of small particles in the ingested air streams that can cause a distortion to the oncoming laminar flow. This degrades flow capacity and can reduce the efficiency of the equipment in a short period of time. This is a particularly serious issue in the oil and gas industry where sticky hydrocarbon aerosols are constantly present.

In the harshest of operating conditions, solid and/or liquid particles can pass through the equipment causing erosion. Erosion that results in moderate to severe material loss can change aerodynamic efficiencies significantly. It can also lead to premature blade/vane replacement and failure. In operating conditions where both erosion and corrosion are present, corrosion can be the primary source of attack by weakening the substrate surface. Once corrosion has initiated, the substrate is more easily eroded being the secondary source of degradation.

Modern coating technology can now be applied to legacy equipment that was not designed to take account of particulate-laden gas streams. In this way the original surfaces can be restored and upgraded with greatly improved anti-fouling and corrosion resistance. Implementing a new coating as part of a refurbishment project can significantly improve the performance and reliability of existing equipment.

## Coating processes in detail

Oxidation and corrosion resistant coatings - as mentioned previously, are usually aluminides applied by a variety



*Coatings can be tailored to specific applications and include an aluminium base coat for corrosion protection and a specialist non-stick final layer*

thermal spray or surface deposition techniques. Corrosion resistant coatings will also use an aluminium base coat that is designed to be conductive - allowing for cathodic protection. The aluminium becomes the sacrificial element and therefore protects the less active base metal component. The electrons flow from the aluminium to the base substrate, which becomes negatively polarized and therefore protected against corrosion.

The basic thermal spraying and physical / chemical vapor deposition (PVD and CVD) techniques allow for different coating thicknesses, but also have application restrictions; the spray techniques can be used to apply a thicker layer but need a relatively flat surface and direct line-of-sight in order to accurately apply consistent coating thicknesses. The deposition techniques typically produce a thinner layer but can coat more complex shapes easily.

The thermal spraying process involves heating a material, in powder or wire form, to a molten or semi-molten state. The material is propelled using a stream of gas or compressed air toward the

material to be coated, or substrate, creating a new surface structure as it impacts. The coating materials can be melted using several different processes, including HVOF, plasma spray, and electric-arc delivery systems. The process can take place under standard atmospheric conditions or in a special, highly controlled atmosphere.

Applications include protection from wear, high temperatures, or chemical attack, as well as providing a substitute for chromium which can be hazardous in some states. Coatings can be metallic, ceramic or any combination required to meet a broad range of physical criteria.

### Anti-fouling

For applications that require improved anti-fouling protection, coatings can be applied to both stationary and rotating blades as well as diaphragms, guide vanes, rotors and impellers. Coatings can be tailored to specific applications and include an aluminium base coat for corrosion protection as well as an inorganic sealer and a specialist non-stick final layer.

These anti-fouling coatings have a thickness between 75 and 125 microns and use polytetrafluoroethylene (PTFE) which gives excellent chemical resistance in low to medium temperatures with a maximum operating temperature of 550 °F. PTFE offers excellent protection from chemical attack from substances with a pH between 3 and 9 as well as resistance to many solvents and fuels. For specific applications that require protection beyond these characteristics, more specialized coatings can be tailor-made to suit a particular application.

### Keeping in balance

In all turbomachinery applications, dynamic balance is a crucial requirement, so the application of any coating system has the potential to upset the balance of a turbine or compressor, even if it is only a few microns in thickness. It is therefore essential that the component being coated is checked for balance both before and after the protection layer is applied.

The techniques and equipment used to apply the latest coatings depends largely on the type of coating being applied and the function of the component. Coatings that are designed to provide high temperature corrosion resistance are often applied using a HVOF gun, which produces a dense coating with a high bond strength.

Due to the precision required in manufacturing and maintaining high temperature turbine blades, these coatings should be applied using a robotic manipulator with automated thermal spray equipment. In this way, the coating is applied uniformly on each blade by removing the human error that is associated with hand spraying. Balancing should then be carried out to ensure each machine will operate perfectly after being protected.

### Improving efficiency

With such high energy requirements, the hydrocarbon processing industry often uses on-site generation plants and the growing demand for power has led to significant research into improving production efficiency. Essentially this can be divided into combustion efficiency and mechanical efficiency.



Combustion efficiency looks at increased combustion temperatures which require the latest coating technologies to prevent heat damage to the components in the hot gas flow.

Mechanical efficiency looks at reducing losses in the power train, including the clearance between the rotor blades and the stator casing.

The clearance is crucial in determining the efficiency of the turbine and therefore a large part of its costs and productivity. Zirconia-ceramic materials can be used to minimize this clearance in high temperature applications. Clearance-control coatings or abradable coatings, function by allowing a rotating part, such as a blade, to cut a path in a sealing abradable layer with minimum clearance. Many advanced gas turbines use a thick ceramic coating to impart both thermal-barrier and abrasive properties.

## Future proofing

As design technology and materials' science advance the newest generation of turbine components can present a considerable challenge to repair specialists. Finding the most suitable coating depends on a number of factors including adhesion qualities, heat and erosion resistance as well as compatibility with the design of the component.

For example, the challenges of protecting components, especially those within the hot section of a gas turbine, are considerable, especially when the temperature of the combustion gas is higher than the melting point of the base materials. The combination of internal cooling ducts and a thermal barrier coating (TBC) work together to maintain the desired component temperature. The latest turbine blades are designed with a large number of tiny cooling holes, often in excess of 500 in a single

part, which must remain unaffected by the coating process.

Conventional thermal spraying processes would block off many of the holes, rendering the cooling system almost useless. However, new coating techniques are required to ensure that none of the cooling ducts are closed off by using conventional plasma spraying processes. Sulzer has addressed this and many other challenges in this area to deliver a bespoke service that ensures the latest techniques are adapted to suit each application.

It is essential that repair specialists, such as Sulzer, continue to develop new coatings and new application methods that can keep pace with the advances in the turbomachinery sector. In this way, plant operators will have the confidence to invest in repairs that have the ability to provide many years of continued service. ■



## Take the crisis out of an Emergency

**A**EMT members are highly skilled Electrical and Mechanical engineers often prepared to work round the clock to collect, repair and return faulty equipment, and keep downtime to a minimum. Most supply, service, and rewind electric motors, and look at the most economical and energy efficient solution.

The majority also repair pumps with some operating in confined spaces to remove and refit centrifugal and submersible pumps. Many also service gear boxes. AEMT members try to prevent problems and are probably the largest network nationally and internationally of companies able to carry out thermography, vibration analysis, and laser alignment. Their mechanical ability to rebuild and refurbish items is legendary. Many AEMT companies are trained to repair and work in Hazardous Areas, and most offer the quality expected with ISO9001.

So when you require help quickly at 1 am in the morning, or 5 pm on a Sunday afternoon, help is at hand! Whether you are in the UK or in Miri in Borneo, just look up the AEMT Website for a list of companies that are able to help you.

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PROMOTING ENGINEERING EXCELLENCE



# Gearbox maintenance for steel manufacturing

For the steel industry it is more important than ever that proper maintenance and repair work be carried out on its plant and equipment to prevent costly and potentially catastrophic failures. Here Andrew Baggaley and Tony Botfield of Brevini UK explain how techniques they have pioneered across several steelworks in the North of England are paying dividends.

Steel making creates some of the harshest working conditions a gearbox may be expected to tolerate. In continuous casting for example, temperatures are extreme with the steel product still red hot and semi-molten when it hits the roll out drives. Add to that a dirty environment,

shock-loading and the runtime demands of continuous production, and even purpose-designed gearboxes will require frequent rebuilds.

It's no secret that resources and overheads have been squeezed within the UK steel industry as it strives to

remain profitable in the global market. While UK competitiveness stems from a reputation for some of the highest quality product produced anywhere, it is also essential that refurbishment of plant is well managed in order to minimise cost and extend service life.





transparent reporting system, which lets the customer see the scope of work carried out on each unit and allows us to open up discussions for future learning.

"The improvements that this process has allowed us to make ranges from tolerances employed to heat reflective paint, to changes to allow the clearance of water cooling pathways. In conjunction with the Central Engineering Team, we have developed specific work procedures for the gearboxes in question.

"Our experience as a manufacture pays direct dividends to our aftermarket customers. In this case the mill is able to minimise its stockholding without getting caught out and losing production capacity. Of course we had to build trust with the various mill stakeholders, including Procurement, Maintenance and Engineering, but they soon saw the value in what we provided".

By repeatedly delivering high integrity refurbishment on extremely tight lead times, Brevini has enabled the client to break out of what had become a vicious circle where maintenance was carried out poorly as a hurried reaction to failures. By making the units last longer, Brevini has made more of the budget available for preventative maintenance, further improving the reliability of the continuous casting process.

As a result of the Brevini service contract the average life in service was

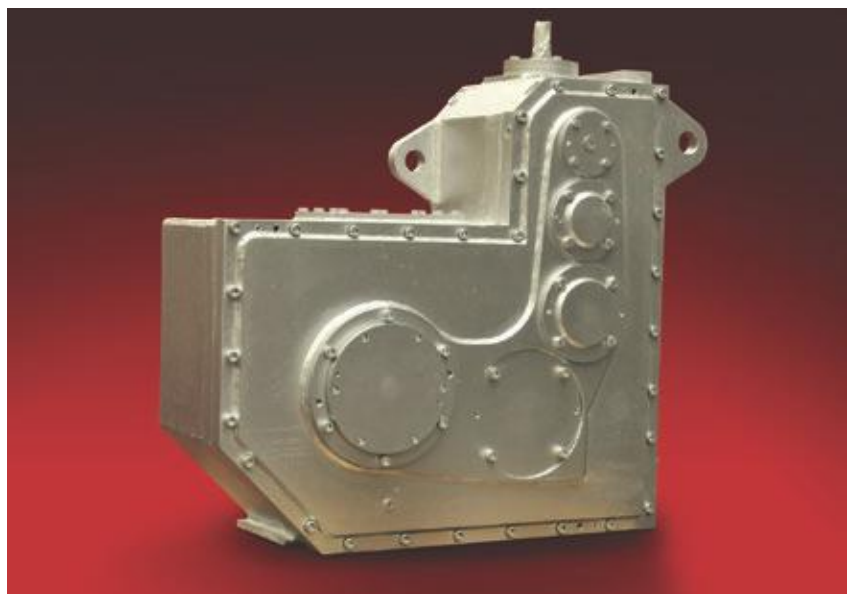


extended to over 18 months, which is an improvement of more than 300%. In fact, in this particular application, the units Brevini services are now routinely returned for rebuild before critical failure occurs due to the Rollout Stand being overhauled for other reasons and the maintenance opportunity arising.

Over the course of 3 years this working arrangement has been extended to several more 'rolling refurbishment' programmes across the mill with similar success. ■

The cost of any unplanned stoppages to the continuous casting process is unbelievably high. Yet, when Brevini conducted its initial evaluation it found that, historically, attention to detail on the spare parts being used had been very poor. As an initial course of action Brevini set about sourcing parts to precise tolerances and rebuilding the units to high standards. The approach didn't add any expense to the maintenance process and allowed Brevini to ensure that any future repairs would be made with components most suited to the task in hand.

Andrew explains, "Because we have developed a close working relationship with the mill engineers, we have learnt what is critical and continued to identify areas where we can make small improvements. We operate an extremely



# Driving change in industry

## Smart finance helps manufacturers upgrade to new industrial era

*Brian Foster, Head of Industry Finance at Siemens Financial Services in the UK*

The large-scale digitalisation and automation of the manufacturing industry has become known as the “fourth industrial revolution”. This major development is driven by the link between the virtual and material aspects of manufacturing. In the fourth-generation factory, smart machines ‘communicate’ with each other to coordinate and carry out production processes.

The so-called Industrial Internet of Things (IIoT), the installation of widespread sensors in the physical environment, and the ability to improve production economics through real-time performance data analytics are at the core of this new industrial

era. Behind the scenes a portfolio of complex information technology (IT) solutions is collating data from a variety of sources such as product development, production and suppliers. Industrial software that allows the virtual integration of different stages of industrial production has a crucial role in enabling these processes.

Fourth-generation manufacturing technology has the potential to deliver important advantages to the industrial sector. More efficient operations, increased production capacity and/or flexibility, higher-quality products and better customer service all contribute to improving the competitive positioning of a manufacturer. Against this

background, competition is becoming more intense. Companies need to continually increase productivity and efficiency of resources to make sure they remain competitive. Advanced industrial software has the potential to help manufacturers meet these challenges.

Control and monitoring solutions enable manufacturers to digitally synchronise product engineering, manufacturing engineering and production to significantly speed up product development. New-generation Product Lifecycle Management (PLM) software allows teams at different locations to interact, develop and optimise new products on an entirely virtual basis. This



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not only has the potential to increase productivity and quality levels but can also reduce time to market by up to 50%. What is increasingly clear, is that in order to fully take advantage of the business benefits of the fourth industrial revolution, manufacturers need to ensure that digitalised operations and processes are backed up by appropriate industrial software solutions.

Investing in fourth-generation IT, however, is not always an easy decision to make. Firstly, industrial software acquisition requires investment and raising the necessary capital can present manufacturing finance managers with a challenge. Additionally, specialist manufacturers (SMEs in particular) often lack the necessary expertise to evaluate whether a particular solution will produce the desired return on investment (ROI) and contribute to continued business success. What can add to the pressure is the accelerated frequency of technology and software upgrades or improvements in the

*Flexible financing solutions that make investments in fourth-generation technology sustainable are, therefore, fast becoming a popular alternative among manufacturers. Technology financing solutions such as leasing can be cost-effective methods of funding industrial software investments and upgrades.*

digitalised production environment.

Flexible financing solutions that make investments in fourth-generation technology sustainable are, therefore, fast becoming a popular alternative among manufacturers. Technology financing solutions such as leasing can be cost-effective methods of funding industrial software investments and upgrades. Such financing solutions spread the cost for the use of the software over an agreed financing period. Payments can be arranged to align with expected savings or improved

productivity delivered by the newly acquired technology. As a result, the costs are at least partly offset by the financial gains through the use of the software. This also removes the need for a large initial outlay, thereby increasing the funds available for other expenditures. In other words, technology finance allows manufacturers access to the latest software solutions without having to commit scarce capital or exhaust traditional lines of credit. Financing arrangements can also provide the flexibility to upgrade in line with technology developments.



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Such flexible technology financing solutions tend to be offered by specialist financiers, often the financing arm of an industrial corporation as is the case with Siemens Financial Services (SFS). Specialist financiers have comprehensive technical knowledge. They can evaluate the impact a potential investment in software or other technology can bring to a manufacturing business, including its practical application in the production process and the expected ROI.

Leveraging their expertise they can design customised financing packages that fit the specific requirements of the customer. This sets them apart from traditional, generalist financiers and

*As the digitalisation and automation of manufacturing continues to accelerate, manufacturers need to remain flexible both financially and technologically.*

makes them a dependable, long-term finance partner for the manufacturing industry.

As the digitalisation and automation of manufacturing continues to accelerate, manufacturers need to remain flexible both financially and technologically. In a manufacturing environment driven by virtual processes it will become

increasingly difficult for businesses to succeed if they do not have appropriate industrial software solutions in place.

Against the backdrop of rapidly changing market dynamics, manufacturers can benefit from alternative financing arrangements offering a degree of flexibility that reflects the fast pace of revolutionary times. ■





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# Viridor has the world's first Liquid Air Energy Storage facility built utilising WEG Motors.



A new 5MW Liquid Air Energy Storage (LAES) facility, designed by Highview Power Storage will soon be operational thanks, in part to some slightly less space age, but still very efficient 175kW WEG W22 IE3 electric motors and efficient EU327 Compliant centrifugal fan systems from Halifax Fan.

**Large power stations using coal and nuclear fuel are also slow to 'turn-down' if demand drops and usually very, very expensive to get going again if you have to turn them off completely.**

## So what is an LAES facility?

An LAES or Liquid Air Energy Storage facility is a new way of storing electrical energy, like a battery, but on a grid-scale power plant platform. A lot of electrical energy is created when the daily demand cycle from the grid isn't high enough to receive it – good examples are renewables like wind, solar and tidal power that are generated based on the weather, not demand.

An ideal solution then would be to be able to store electrical energy for a few hours when demand is low and release it again quickly when demand (and in some instances – the price) is higher.

*The components of Highview's processes were chosen purposefully from large OEMs so they could be readily adapted and have proven operating life times and performances.*





*Fast, effective peak-opping is an extremely desirable function from an energy grid management point of view and this is one reason why government funding has been provided. It is also a reason for considerable global commercial interest in the project.*

An LAES facility uses a large gas compressor to turn air to a liquid then store it in insulated, pressurised tanks, which keeps it as a liquid. In order to generate power the air is heated and allowed to expand again, the pressure then pushes a gas turbine around to generate power. The only emission created is air...

After having built and tested a successful pilot plant, Highview and project partner Viridor were awarded government funding by the Department of Energy and Climate Change (DECC) to build a pre-commercial scale 5MW Liquid Air Energy Storage technology demonstrator. That LAES plant is now currently undergoing final commissioning in Bury Lancashire.

## How exactly does an LAES work?

Air turns to liquid when refrigerated to  $-196^{\circ}\text{C}$ , which is usually achieved by a cycle of compression, cooling and expansion, it can then be stored in conventionally insulated, ambient pressure vessels at very large scale.

Exposure to ambient temperatures causes rapid re-gasification and a 700-fold expansion in volume, which is used to drive a turbine and create electricity.

Highview's technology draws from established processes from the turbo-machinery, power generation and industrial gas sectors.

Stuart Nelmes Head of Engineering at Highview explains, "The beauty of this system is that each component part of the process is built using tried and tested technology, which we know works and has established performance parameters. The centrifugal fans sourced

from Halifax Fan and driven by WEG motors, fitted our remit very closely."

The LAES system comprises of three primary processes: a charging system, an energy store and a power recovery stage. The energy efficiency of each stage is crucial to the economic viability of the project. Because the system has to either power itself with the electricity generated, or buy it from the grid; the energy efficiency of each component is very important.

Halifax has developed its centrifugal range to maximise energy efficiency and WEG offers a very energy efficient IE3 motor as standard so this also influenced

*The project will operate for at least one year and is intended to demonstrate how LAES can provide a number of electricity grid balancing services, including Short Term Operating Reserve (STOR), Triad avoidance (supporting the grid during the winter peaks) and testing for the US regulation market.*



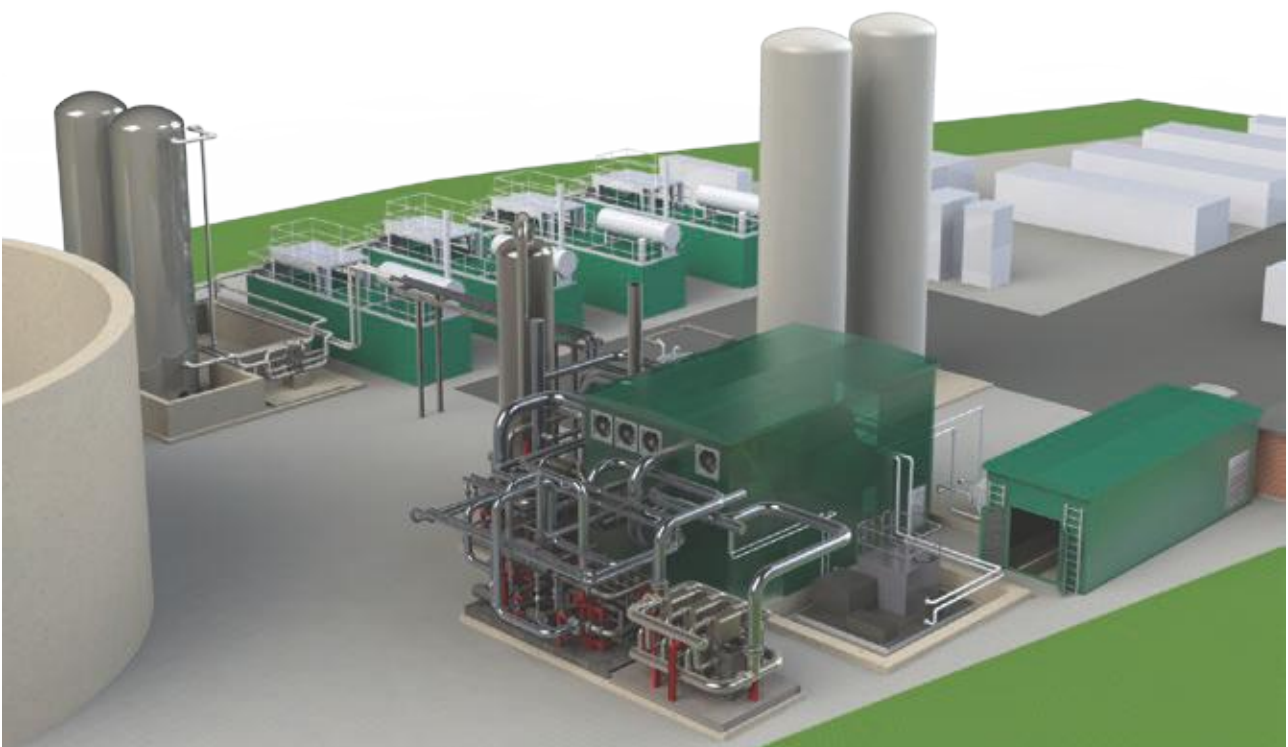
*The centrifugal fans employ 175kW WEG W22 Premium Efficiency IP55 IE3 3~ electric motors. They are foot mounted to a skid and connected using a torque limiting anti-vibration coupling to the fan drive shaft.*

our decision. ‘Every little helps’ in this situation!

There is a big temperature change as the gas is converted to a liquid and back again. It is the same principle used to make your kitchen fridge cold but more akin in scale to the effect you see freezing moisture in the air creating slabs of ice that crack off the surface of a space rocket as the fuel tanks empty. A very reliable, well-proven blown air solution was needed to regulate the temperature and airflow around some of the key components in the system.

### Green machines

The green credentials for the LAES technology are off the scale compared to other large-scale energy storage methods; once constructed the commercial installations will be close to environmentally neutral, output is simply air, (or in the case of this test unit inert Nitrogen supplied by BOC, which makes up 78% of the air anyway). Commercial installations are likely to be used as temporary energy banks for larger power stations, which are both slow and expensive to turn down, or turn off.





The solution would also be very effective for storing energy from renewable sources such as wind turbines when there is a grid surplus and then fed back into the grid when demand peaks. The project will operate for at least one year and is intended to demonstrate how LAES can provide a number of electricity grid balancing services, including Short Term Operating Reserve (STOR), Triad avoidance (supporting the grid during the winter peaks) and testing for the US regulation market.

Construction on the project began in February 2015 and it is expected to be operational during 2016. Highview's LAES technology can be scaled up from around 5MW output and 15MWh of storage capacity to more than 200MW output and 1.2GWh of capacity. It can be considered as being comparable to medium scale pumped hydro-electricity storage, but without the geographical restrictions of mountains and reservoirs.

*Construction on the project began in February 2015 and it is expected to be operational during 2016. Highview's LAES technology can be scaled up from around 5MW output and 15MWh of storage capacity to more than 200MW output and 1.2GWh of capacity.*

When scaling up LAES technology, the system will be modular and benefit from scale and convenience, an advantage when locating it to different regions and applications.

Some of the key benefits of Highview's LAES system are:

- No geographical constraints (unlike pumped hydro or compressed air energy storage)
- Low capital and operating costs using long established global equipment suppliers and installers
- Long lifetime of over 30 years with components available off the shelf with thousands of hours of proven operation in many applications
- A small footprint and high energy density compared with other energy storage solutions and no harmful emissions.
- The system is completely modular and scalable from around five megawatts to hundreds of megawatts in power and up to 12 or more hours in duration. ■

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*The original Abbey Mills A pumping station is a Grade II listed building, built between 1865 and 1868, while the original ornate pumping equipment is Grade I listed.*

# Upgrades to the Historic Pumping Station at Abbey Mills increases storm water storage.

The Thames Water Tideway Scheme includes the Lee Tunnel project which will increase storm water storage and prevent it from spilling into the River Lee at Abbey Mills. Part of this project includes the refurbishment of the eight pumps at the historic Abbey Mills (A) pumping station, a task that was contracted to Sulzer.

**Thames Water is continuing the enormous task of upgrading the London sewerage system to cope with the expanding population and improve the water quality of the River Thames. The Lee Tunnel project involves the construction of a new tunnel measuring 6.9 km in length and 7.2 m internal diameter which will provide approximately 382,000m<sup>3</sup> of storage, and delivers it to Britain's largest sewage treatment works at Beckton.**

The original Abbey Mills (A) pumping station is a Grade II listed building,

built between 1865 and 1868, while the original ornate pumping equipment is Grade I listed. Following the commissioning of Abbey Mills (F) pumping station in 1998, the older station was re-designated as a standby storm pumping station.

Station A at Abbey Mills acts as backup to Station F to assist with exceptional storm flows and as such must have fully operational and efficient pumping equipment in order to accomplish this role. In all there are eight pumps, originally designed in 1933 and powered

by 600 HP, 2.2 kV, 28 pole motors. As part of the ongoing maintenance of the site, these pumps, the motors and control gear have been refurbished by Thames Water.

Thames Water have used Sulzer to overhaul five of the W.H. Allen 48 inch pumps at the station as part of a series of previous projects and on this latest project Sulzer has completed the full set by refurbishing the remaining three pumps. Working alongside other contractors that were responsible for the replacement of the motors and





The design and manufacturing work was completed at Sulzer's Leeds Service Centre.



The outward appearance of the pump unit is very similar to the original and very much in keeping with the historic appearance of the equipment within the Abbey Mills station.

gearboxes, Sulzer engineers coordinated their operation to ensure the project was completed as efficiently as possible.

Chris Powles, Managing Director for Rotating Equipment Services in the UK, comments: "The project has presented a number of challenges in terms of component design as well as operating in a working museum. It has been essential to preserve the historical importance of the site while also designing and installing modern, more efficient components that will significantly prolong the operational life of the station."

When the first pumps were refurbished back in 2005, Sulzer took the opportunity to address a number of design issues and introduced a new intermediate shaft made from carbon fibre, as well as redesigning the bearing arrangement. Improvements were also made to the stuffing box bush arrangement and a new carbon steel impeller was installed to increase service life and simplify future repairs.

The design and manufacturing work was completed at Sulzer's Leeds Service Centre and also included the introduction of a split mechanical seal to replace the gland packing for improved reliability and reduced maintenance requirements. This was installed with a bespoke seal flushing system that is connected to each of the pump units and is essential to ensure that the mechanical seals perform reliably. In addition, the re-designed thrust bearing

arrangement is designed to save around 5 kW of absorbed pumped power as well as increasing the mean time between failure (MTBF).

The outward appearance of the pump unit is very similar to the original and very much in keeping with the historic appearance of the equipment within the Abbey Mills station. Meanwhile the internal components have been designed to deliver greater reliability using more standard parts that simplify maintenance requirements and minimise any repair times.

The project has been completed to The Water Industry Mechanical and Electrical Specifications (WIMES) as per Thames Water requirements and the design improvements that were initially installed in 2005 have now been applied

to all eight pumps. The on-site work and actual pump refurbishment was completed by Sulzer's Ashford Service Centre, which has operated as the single point of contact throughout the various projects undertaken at Abbey Mills.

Chris Powles concludes: "Engineers from the local service centre carefully coordinated their work to remove and reinstall the pumps with the other contractors that were tasked with replacing the motors and epi-cyclic gearboxes, as well as with Thames Water themselves, who needed to keep the pumping station operational throughout the project. As a result of this and the previous projects, the historic Abbey Mills pumping station will be able to continue its supporting role for many years to come." ■



The re-designed thrust bearing arrangement is designed to save around 5 kW of absorbed pumped power as well as increasing the mean time between failure (MTBF).



Screw Lift

# Flood defence pump station at Grimsby Docks gets an overhaul

Grimsby's Freshney pumping station is a key element of the town's flood defences which were first enshrined in statute way back in the Grimsby Haven Act of 1796. When the pumping station was first built more than half a century ago it was equipped with three large Archimedes screw pumps. These were replaced some years later, but time and exposure to the elements have resulted in corrosion and wear, so in 2016 a major refurbishment programme was implemented in respect of the No.3 pump.

Over the years, the pumping station has been called into action on several occasions, but it is more than five decades since all three screws were operated simultaneously to prevent flooding. Almost a decade has passed

since the last time that two of the screws ran simultaneously, indicating that should circumstances arise the station has adequate capacity to cope. In the words of Phil Christy, Grimsby Dockmaster: "It's a pretty impressive

piece of kit when it is running. It is simple to use and runs the same as a ship's propeller." Each of the three screws weighs 7 tonnes and the station has the pumping capacity to shift 6,000lt/sec.



Like all pumps, wear and tear eventually takes its toll and in the case of the No.3 pump AxFlow's Huddersfield Service Base was contracted to undertake extensive and essential remedial work in the early part of 2016. Although the condition of the pump could be seen before removal of the screw itself, extensive examination undertaken once the pump was removed (Fig.1) from service revealed serious corrosion of the deflector plates and all the cover grids were completely rotten. What did emerge was some fairly major works to be undertaken to replace two of the gears within the gearbox though.

“The extent of our tender for the No. 3 pump included removing the screw, the cover grids, deflector plates, top and bottom bearings, motor and hand railing”, reports Mark Redgrove, AxFlow Technical Support Manager. “The screw was shot-blasted and coated with a Polyurethane coating to a thickness of 2mm to provide the 10 year life requested by the customer. The deflector plates, cover grids and handrails were all badly corroded and replaced with new items in galvanised 3mm steel plate.” ■



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NTN-SNR at Lichfield

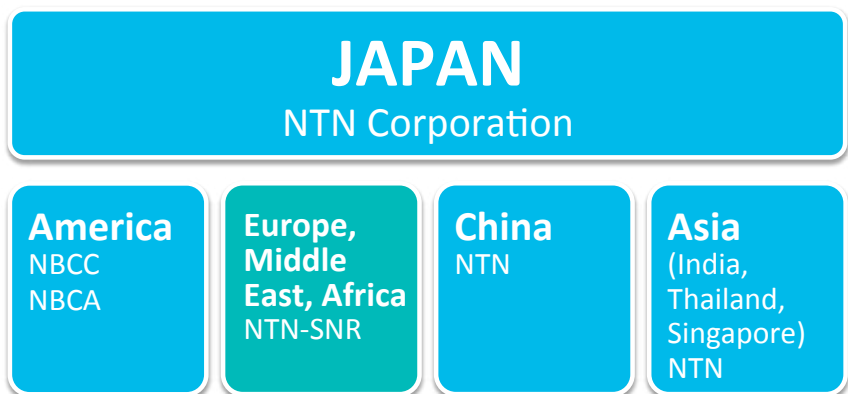
# NTN-SNR bearings looks at the aftermarket

Understanding how a multi-national conglomerate such as the NTN-Corporation operates can leave many-a-head whirling. With a past that spans back nearly a 100 years, they have acquired many brands across the globe and operate from many 100s of locations. To get under the skin of such a company can be difficult.

Since NTN-SNR joined the AEMT as members in 2015, many would have dealt with their distribution centres and not come across the company directly. Mike Wooldridge (Head of Industrial Aftermarket) and Anthony Urion (MRO Sales Manager) have since turned this around by making their presence more available through the AEMT.

At that time NTN-SNR contributed 14% of the colossal €7.5 billion value of the EU bearing market. Granted, a majority of that market is OEM & Automotive for NTN; but the aftermarket is a sector that is growing rapidly.

The NTN Corporation started its humble beginnings in Osaka, Japan in 1918. Since then they have become a world



leader in the design, development and manufacture of bearings (among other products) to the industrial, automotive and aerospace markets. Their counterparts in France, SNR, also began trading at the beginning of the

20th century, and in 2010 NTN acquired the company from Renault to create the company that exists today for the Europe, South America, Africa and the Middle East (the EMEA).



NTN Bearings were used for the TGV World Speed Record 574 k-mph.



NTN's new range of high-precision Ultage Bearings

NTN-SNR Roulements manages the group's activities now for these markets. In Europe they employ nearly 6 000 people at 12 production sites, as well as 19 distribution centres and offices. The group's development strategy is based on three main elements: innovation; presence in the market, and a service based on quality and customer proximity.

NTN-SNR's bearing technologies are present in a large amount of equipment and machines used in construction and utilities. They are found in mines and quarries, the steel industry, agricultural machinery, food processing, pumps,





motors, turbines, and transmission markets. Finally, on the promising renewable energy market, NTN-SNR is a major partner of the largest manufacturers of wind turbines and other power plants.

### Innovation

NTN-SNR currently invest 4% of their annual profits on research and development enabling them to have two research facilities in Europe with 200 staff on hand. The core drivers for research stem from both their commitment to customers and the environment. With ISO 14001 (Environmental Management) and 50001 (Energy Management) certificates to uphold, they have committed to reducing their products and facilities

impact on the environment.

It is clear when you look through the company's press pages that technological boundaries are constantly being pushed for all its sectors. The most famous of these is the major contribution to the success of the high-speed rail record achieved by a specially modified French TGV.

Critical to the success of this challenge was in the bearings; SNR developed bearings with an optimised internal geometry and complete control over temperature issues. One of the most striking things to note, is after reaching the recording-breaking speed of 574.8 km/h, the bearing temperatures only rise by a maximum of 10°C.

*NTN-SNR's bearing technologies are present in a large amount of equipment and machines used in construction and utilities.*

For industry, the most significant innovation is the introduction of their new range of high performance ULTAGE bearings.



*NTN Ultage Bearings.*

## ULTAGE

The ULTAGE range includes a hundred high-precision spindle bearings for assembly into machine tools on the European market. The outstanding design and high quality materials used in ULTAGE bearings means you can expect them to perform accurately at high running speeds for longer periods. NTN-SNR has worked with several major European retailers to define an initial range of both OEM and spare-part ULTAGE bearings comprising of single row angular contact ball bearings, covering most of the needs of machine tool equipment. The 98 models in this range of HPACBB (High Performance Angular Contact Ball Bearings) benefit from ULTAGE design and meet the high quality requirements currently demanded. The initial 7000 and 7900 series that make up this range have bore diameters of between 10 mm and 130 mm and two contact angles of 15° or 25° - the most commonly used in Europe. These bearings enable all types of universal matching. They have a normal average preload and an accuracy class of P42. They can withstand rotational speeds of up to 1.9 million Ndm, while maintaining a high rigidity.

The bearings are equipped with an innovative, high-performance polyamide cage. This gives improved lubrication thanks to a design that combines a tapered bore with grooves in the pockets. With this cage, NTN has created a design that has become the standard for spindle bearings in Japan and is also poised to become a standard in Europe. NTN relies on market knowledge as well as logistics to be the largest distributor of bearings in Japan. To achieve the same status in Europe, it has based its European logistics centre in Lyon, France. Following a re-organisation of its logistics, this centre is dedicated exclusively to the industrial bearings market. From this hub, the full ULTAGE range can be delivered to dealers in record time and thus meet most of their demands, while maintaining good service levels.

NTN's technical support from their Experts & Tools department is well established and they pride themselves on efficient and responsive technical support. Teams of qualified engineers throughout Europe form a network to help distributors and end-user clients with any technical problems. On top of this, an exchange program allows Japanese workers to transfer to and from Europe so that there are always Japanese speaking workers that work slightly different hours to the rest of the staff in Europe, so that they can communicate effectively with the Japanese offices, should they need further support from experts there.



*NTN Spindle.*





Robert Burley, Samantha Turner and Anthony Urion in front of the NTN Bearing Box.

## Bearing Box

**In the UK, NTN-SNR have a commitment to educating their customers to handle their bearings responsibly. The Bearing Box is a convenient all-in-one training trailer, which contains all the necessary equipment to provide presentations on theoretical, basics and the full hands-on practical learning experience. The trainer, Robert Burley, is a time-served fitter, and understands the necessities of the job.**

Technicians are able to get practical guidance on how to manage the

replacement of bearings bespoke to their needs. For example on a site visit to one customer, a major UK food manufacturer, it was discovered that premature bearing failures were happening as a result of the high pressure washing regime used to clean areas of the plant. NTN were able to recommend a stainless steel bearing with solid lubrication to prevent the flushing of the lubrication and subsequent corrosion.

Not only can the Bearing Box team educate NTN-SNR's customers on the selection, removal, installation and lubrication of any bearing, but there is also the opportunity to learn how

to analyse the root cause failure of a bearing.

Looking at the wear patterns on the inside track of a bearing, you can read the clues and signs on whether there were load issues, lubrication problems, contamination and many other issues related to common bearing failures. The information gleaned is priceless so that the same mistakes are not made again.

AEMT Members are in a special position to be able to take advantage of this service free of charge, with the additional advantage of being able to have employees trained in-house.

## Bearing Installation

When it comes to installing bearings, it always pays to go for quality products. The market leaders produce quality bearings that can run the test of time when installed correctly. Most AEMT members will only fit high quality bearings so that they can offer 12 month guarantee with repaired or refurbished equipment, it is not worth the risk of installing second grade bearings.

When a perfectly good bearing is installed only to fail shortly after going into action, it is easy to assume the

bearing was no good in the first place. The bearing companies have their work cut out, convincing customers that their bearings are rarely the cause of an early failure. According to statistics, over half of bearing failures are down to lubrication; and 1 in 5 failures are down to poor fitting techniques. Educating their customers on how, when and where bearings can fail is an important strategy for any high quality bearing company like NTN.

Most of the work going through a typical repair workshop automatically has new

bearings fitted. It pays for repairers not only to understand the technical requirements of bearing installation, but the correct techniques and procedures. NTN found that many technicians cleaned the transit oil from new bearings before fitting them, which is totally unnecessary. The use of bearing heaters and induction plates to heat bearings prior to installation, and using propriety tools to remove old bearings, technicians are easily able to save time and ensure that a bearing is correctly fitted. ■

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# Dr. Martin Killeen joins AEMT as Lead Lecturer and Technical Specialist

After retiring from his role as Head of Advanced Manufacturing and Technology at Loughborough College earlier this year, Dr. Killeen joined the AEMT as Lead Lecturer and technical specialist in September.

**Martin started his career with an apprenticeship at Brush Electrical Machines, becoming a design engineer for Turbo Alternators. He then became their senior design engineer for the traction division. Via Loughborough College he has been involved with the AEMT Hazardous Area Courses for 20 years. He has built up a tremendous knowledge of IECEx standards with regards to Hazardous Areas, and has trained a large number of engineers and technicians involved with Hazardous Area Equipment Repair.**

The AEMT are very pleased to welcome Martin on board as an integral part of the secretariat. He brings with him a vast pool of experience when dealing with educational bodies and an advanced

understanding of training. He will help the AEMT develop further training, apprenticeships and educational courses.

Martin explains, "After many years working with the AEMT at Loughborough College, I have got to know the association and its members very well. When I had a chance to lecture for the AEMT, I enjoyed the opportunity very much. It is the logical next step after saying goodbye to many good years at Loughborough College to join the AEMT and I look forward to now putting my full attention to developing areas of the association."

Tim Marks, Secretary of the AEMT adds, "I am very excited to have Martin working with the AEMT. We have

worked very closely with Martin at Loughborough College for 20 years, and it will be a boon for the AEMT to have him oversee the future of the association's training courses. Not only that, but he will represent the AEMT on many international standards committees whilst also offering his technical expertise to members."

Martin has already run Ex training courses in module's 1, 2, 3(2R) and 5 at Loughborough, Thailand, Singapore and Dubai since starting in September. He has chaired the AEMT Brexit forum at our conference this year and was also present at the Frankfurt EXL 31/3 Meeting for IEC 60079-19 (International Standard for Ex Equipment Repair, Overhaul and Reclamation). ■

# AEMT Conference 2016 and Brexit Forum

After the success of the 70th anniversary dinner in 2015, the AEMT Conference started with dinner and drinks at Dunchurch Park this year as well. It was great to see some old and new faces at the occasion and it was a very good night to start off the conference.



The guest speaker, Nigel Redman, immediately peaked guests' interests by talking about the recent successes of the Team GB swimming team in Rio earlier in the year, for which he coached the coaches. Nigel's background came from playing international Rugby Union for England, and you might ask how a forward row lock wiggled his way into coaching a swimming team; but listening to his passionate talk, reflecting on life lessons and experiences, one quickly realises that Nigel is not a man to back down from a challenge. "My tall, overbearing appearance, can lead some to believe me to be an aggressive, simple character" Nigel suggests; and they couldn't be further from the truth. Nigel has a very gregarious and affable nature that kept guests speaking with him way after his speech had finished.





In previous years, the conference has been held in the Garden Rooms at Dunchurch Park. This year however, we moved it into a larger, permanent marquee to take advantage of the open plan space and facilities. Along with a total refurbish of the hotel's bedrooms and facilities, the conference was even better than previous years.

There were several talks held before holding a forum on the association's perspective on Brexit. Roland Renshaw of DMA Europa began with an interactive talk on the pioneering possibilities of marketing, which should be taken advantage of now before becoming more mainstream. His talk started by controversially asking everyone to turn their mobile phones on, after which he demonstrated how they could be used in augmented reality situations for brochures, posters or any object you choose. The AEMT has recently started a partnership with DMA Europa and is looking forward to using Roland's ingenuity when it comes to marketing and PR in order to boost the industry's awareness of the association and in particular; the members.



Alex Broadley, who has talked for the AEMT at a previous 2015 event, returned from Siemens to talk about future technologies in Industry 4.0. The 'internet of things' technology is already being integrated into condition monitoring equipment as well as rotating machines at airports, car manufacturers and larger plants. It won't be long before the technology is turning up in members' service centres and important that it is understood.



For those looking to pursue excellence in their service centres for Ex equipment, Phil Oates of SGS Baseefa explained the route members should peruse in order to become an IEC Ex certified service facility. Dr Martin Killeen followed by giving an overview of updates to IEC 60079-19, the Ex repair standard.

### Brexit Forum

In order to establish the role of the AEMT in the lead up to Brexit, a forum was held in the afternoon to discuss topical aspects and viewpoints. A panel chaired by Dr. Martin Killeen included Howard Lyn of Rapid Solutions in Azerbaijan; Tiffany Scott of Houghton

International; Colin Dawson of Whitelegg Machines; and Lucie Hodkova of Exico Motors.

Topics covered included manufacturing standards, migrant workers, training and apprenticeships, and export.

The UK, and indeed the AEMT, are contributors to international standards that dictate how we design, manufacture and repair rotating equipment. Because of this, there is no worry about changing standards when we leave the EU.

1. L-R: Colin and Liz Dawson of Whitelegg Machines; James Simpson and Howard Lynn of Rapid Solutions; Simon Swallow of Rotary; Len Jones of Parsons Peebles.
2. Robert Shoebridge of W H Shoebridge and Tom Beatson of Beatsons Fans and Motors
3. John Windsor of Rewinds and J Windsor
4. Sam Bennett of E Bennett Electrical with Martin Knott of TEC Motors
5. Nigel Redman speaking after the Dinner

Europe doesn't issue many standards anymore, instead they incorporate what the International Commission for Electrotechnical Standards (IEC) and International Organisation for Standards (ISO) issue (which are then harmonized as European EN standards). Usually it is these international & EN standards that BSI converts to use in the UK as BS standards - normally without any adjustments.

Directives including the CE mark and ATEX Ex mark are dictated by European law, and it is this area where we will still need to conform with some directives for continued ease of access to the EU.

The skills shortage in the UK repair industry, means that many AEMT companies look to Europe for additional skilled labour. Skilled labour that is not from the UK and should remain in the UK. Education and training of UK citizens is currently not adequate enough to plug the skills gap, and until this criterion is met, the borders should not be closed to those with the skills the UK doesn't have.

Export is a dynamic market with great fluctuation. The Forum didn't discuss what would happen with the president-elect being Donald Trump, as that didn't seem likely at the time. It was mentioned, however, that at the time, Trump didn't look favourably on the UK. In recent news, this viewpoint is still up in the air, although possibly with a more favourable outlook.

A combined Brexit, and unpredictability of Donald Trump means the export market is particularly uncertain. A weak pound does put the UK in a favourable position though and with Australia, New Zealand and Canada all keen to setup favourable trade deals, the future looks bright. The government will need to ramp up the support it already offers exporters; there needs to be more grants available for international trade missions, conferences and exhibitions.

The AEMT is an international association, with members from all over the world and the association will continue to support members through training, education and remaining active in the international standards committees, so as to offer the highest quality of technical support. ■







9



10



11



12

- 6. Steve Ashman at his stand for Solutions in IT.
- 7. Gennaro Poli of Hidrostal with Steven Heathcote of Pump Supplies interacting with DMA Europa's brochure.
- 8. Samantha Turner from the NTN Bearing Box team.

- 9. Robert Burley from the NTN Bearing Box team.
- 10. Alex Broadley of Siemens presenting to delegates.
- 11. Mark Davies of CEMB Hofmann with Dr. Martin Killeen of AEMT.
- 12. The Brexit Panel (L-R): Howard Lyn of Rapid Solutions; Tiffany Scott of

Houghton International; Dr. Martin Killeen of AEMT; Colin Dawson of Whitelegg Machines; Lucie Hodkova of Exico Motors.



# Keeping Equipment Turning: Motors, Pumps, Electronics & Manufacturing

Steve Ashman of Solutions in IT and Chair of the AEMT Marketing Committee interviews Paul Pearce, the Sales Director of Mawdsley BER Limited, an electric motor repair and rewind business in the South West.







*There is a time when you have to stop, lift up your head and look around. Taking time away from the coal face to re-assess the way you currently do things is important.*

### What does outstanding service mean to you?

First of all, you have to have the technical ability and facilities to do the work. These two elements create a platform on which the delivery of the final product can take place. By investing time and effort in the correct systems and processes we can eliminate the majority of incidents that cause delay, but the overriding thing is every member of staff understands the need to change and evolve. This breeds a culture of high standards, identifying where things could be improved and committing to positive change is the key to success.

### How does this impact the relationship with the customer?

Customers have basic needs. They want the job doing properly and on time. They want you as a company to be honest, know what you are talking about and come back to them with answers promptly and never leave them waiting. These answers come from having systems that are intuitive and reliable. The answers are all held in our business system, live information that is constantly updated. We can make accurate decisions in real time, we don't lose time having to phone the client back and importantly, the customer is not left waiting for information.

### What is the current technical capability at Bristol?

In the main, the experience of our workforce counts, needless to say Mawdsley's have held onto fully qualified engineers for many years. These people are the life-blood of our organisation and ensuring that they are kept up-to-date with the latest practices and equipment is our starting point. Alongside them,



Paul Pearce, MD at Mawdsleys

we have a culture of apprenticeship training and internal promotion. All of our year 2 and 4 apprentices are sent to Loughborough College to attain NVQ and BTEC qualifications, whilst maintaining a practical and useful commitment to on-the-job training. This industry, like many others, is constantly changing. As a business, supplying innovative solutions that are more economical and easy to maintain is really important. Our philosophy relies on Mawdsley BER striving to be the best or clients will simply seek alternative arrangements and we don't let that happen!

### How do you discover cutting-edge technology?

There is a time when you have to stop, lift up your head and look around. Taking time away from the coal face to re-assess the way you currently do things is important. There are a growing number of trade shows in the UK catering for the industry and we are proud members of the AEMT (Association of Electrical Mechanical Trades), an organisation which, for over 75 years has promoted best-practice and innovation. ([www.aemt.co.uk](http://www.aemt.co.uk))

### Tell us about Mawdsley BER?

The company was originally called Bristol Electrical Repairs in 1959 until the Mawdsley's acquired the business in 1999, so it has a long-standing history in the area. As a business, our core work is the design, manufacture and repair of rotating electrical equipment, including AC and DC motors. Our workshops carry out motor rewind and repair work and we have a fleet of engineers for on-site work. The important thing for us is the quality of service we provide, ensuring we have outstanding technical knowledge, so that we can repair all manner of rotating equipment.

*Customers demand efficiency, control over costs and look for ways to save money. You can't make recommendations on these terms without supplying the whole solution.*

**Tell us about the skill-set at Mawdsley's, what would you say are your specialist areas?**

We are authorised dealers of ABB and Brook Crompton motors, we service and repair all manner of rotating equipment, motors, generators and pumps including wound stator packs, barred rotor assemblies, armatures and all types of coils. Thanks to the fact we can make these in-house, helps us to keep lead times down to a minimum, something highly appreciated by our customers. We carry stock from many different manufacturers, and can source most types of motors and drives.

**...and the controls?**

The control systems of these items are just as important. Customers demand efficiency, control over costs and look for ways to save money. You can't



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*\*Mawdsley BER use EMIR Smart Site, an Apple iOS and Android application that delivers job information to the hands of the engineer in real-time, allows the recording of time and materials, the creation of service and health & safety checklists and allows the customer to sign on screen for completed work.*

**You can discover more about EMIR from their website ([www.emirsoftware.com](http://www.emirsoftware.com)) or their YouTube channel or by contacting [info@solutionsinit.com](mailto:info@solutionsinit.com).**



make recommendations on these terms without supplying the whole solution. We are able to manufacture or repair control panels and all of the electronics needed, from the smallest motor control panels right through to complex suites of panels incorporating drives, PLCs and associated automation equipment. As far as customers are concerned, Mawdsley are a one-stop provider which cuts out inevitable delays coordinating multiple suppliers on any project.

We consult and advise on the most appropriate solution ranging from a repair of the existing installation however old, sometimes manufacturing components from scratch which can no longer be purchased, we do all of this in-house or make recommendations on new equipment where the economics of the situation dictate greater savings.

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*We consult and advise on the most appropriate solution ranging from a repair of the existing installation however old...*

assessment when all of this information is in one place.

**Where do you see all of this taking you?**

The focus is very much on our engineers in the workshop and out on the road and ensuring that everyone in the organisation has the information they need, when they need it. This will mean an emphasis on making the best use of mobile devices and getting rid of paperwork which invariably causes delays. The first part of this strategy is already in place.\*

In truth, we have a bright future. We have the right people in place and with their skills we attract and maintain

business from all sectors of industry. We've always had an open-door policy and invite any business with the challenges of maintaining a variety of electrical assets to get us involved.

“With EMIR in place all of our processes and documentation are taken care of, one less thing I need to think about. With all of this information to hand I can spend more time on what’s important, the customer.” Paul Pearce, Sales Director, Mawdsley BER Ltd

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 MKE Engineering Group, Mr Martin Savage

“The EMIR system has been superb and the company has definitely moved forward as a result. EMIR has all the facilities to generate the reports we need whilst the job costing and invoicing processes have been accelerated markedly. It’s really helping to bring our company into the 21st Century.”  
 Dorloc Ltd., Mr Paul Barnett

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**What is EMIR?**

- EMIR is business software specifically designed for the electro-mechanical industry.
- Electric motors, pumps, generators, control panels, compressors, gearboxes, alternators, transformers, electronics – this is our speciality!
- 17 Modules and Extensions mean that every aspect of a repair & service, assembly & manufacture, sales & distribution and hire business is covered.
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**What will it do for you?**

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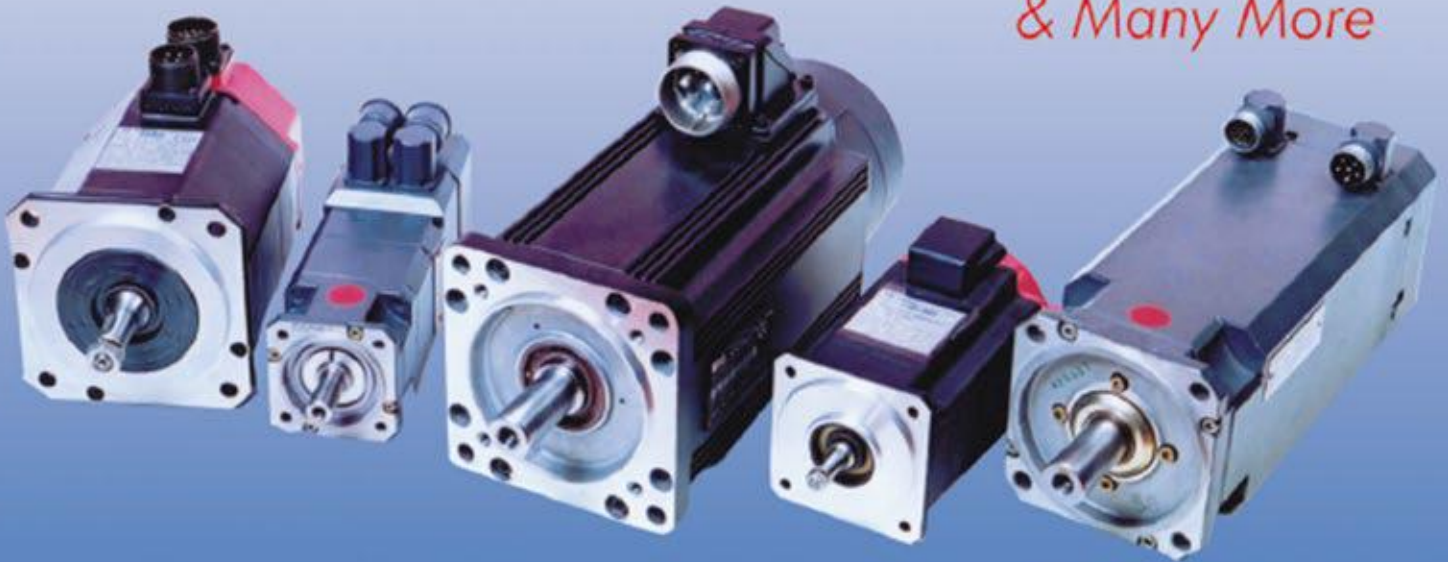
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