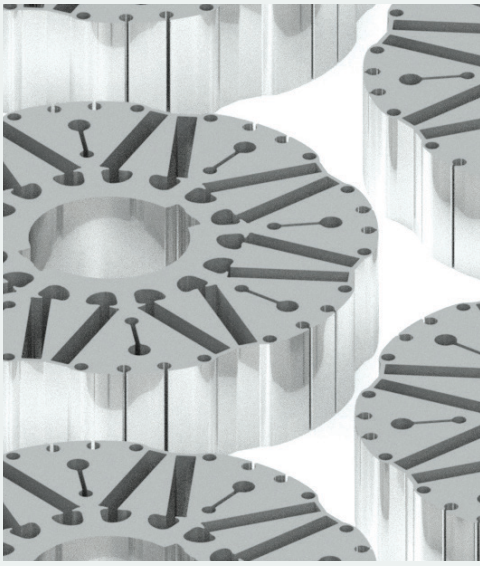
AEMT Journal

Volume 18 Issue 1 www.theaemt.com

ASSOCIATION OF ELECTRICAL AND MECHANICAL TRADES



INSIDE THIS ISSUE…

PARK GATE & COMPANY LTD

Re-Conditioned Motors

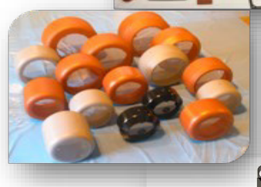
- Cage up to 1mw Ex Stock
- Slip-Ring up to 500kw Ex Stock
- D C Motors
- High Tension Motors 3.3Kv
- Geared Motors
- Two Speed Motors
- Vibrator Motors

New Motors

- Cage up to 400kw Ex Stock
- Slip-Ring up to 315kw Ex Stock
- Geared Motors and Vibrators

Large Stocks of Electric Motor Spares Both Current and Obsolete Including:-

Brook Crompton Series 7 Steel Motor Spares
Brook Crompton Series 6 Cast Iron Motor Spares



- Fan Covers
- Terminal Box Assemblies
- Endshields
- Bearing Covers
- Slip-Ring Assemblies
- Brushgear
- Carbon Brushes
- Cooling Fans

Variable Speed Drive Specialist

Schneider Altivar Range of Variable Speed Drives from 0.18kw to 315kw available Ex—Stock

87 Kingstown Broadway, Kingstown Industrial Estate
Carlisle, Cumbria, CA3 0HA
Tel : 01228 552000 Fax : 01228 552001 E-Mail: electrics@park-gate.co.uk

Schneider Electric

nqa. ISO 9001 Registered — UKAS QUALITY MANAGEMENT 015

BROOK CROMPTON AUTHORISED MOTOR CENTRE

AEMT The Association of Electrical & Mechanical Trades

Enquire about Membership now!
Visit www.theaemt.com or
Call 0 1 904 674 895

What are the benefits of membership?

✓ Network & Build Business
Meetings and Events designed to share industry knowledge and improve industry standards and relations.

✓ Benchmarking
Measure your performance against other members through the data and stats the AEMT gather each year.

✓ Technical and Business Support
Offering Technical support on Ex Hazardous Area repairs and electric motor design. Our business helpline offers support on employment law, health and safety, Tax and VAT, and Commercial Legal help.

✓ Representation on international technical standards
We represent our members on international and UK design and repair standards. Members can have a direct influence on the writing of these standards.

✓ Targeted PR and Advertising
The AEMT promotes itself and its members through it's own PR, advertising and technical papers.

✓ Mark of quality
Being an AEMT member gives you access to a deep pool of knowledge. Together with the associations Codes of Practice, members are elevated by the mark of quality that comes with the AEMT.

AEMT at a Glance

285 Members Internationally in over **500** locations

Representing the UK service centre market worth over
£380 million

Representing roughly
6,000 workers in the electrical and mechanical trades globally.

Trained **86%** of all IECEx Certified Service Facilities in the UK, UAE and South East Asia.

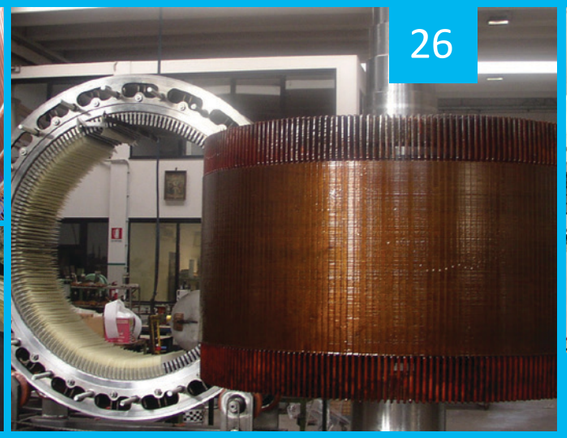
AEMT

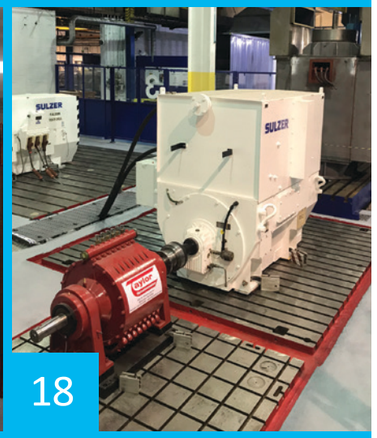
ENGINEERING EXCELLENCE

The Industry's Trade body for Emergency Response Engineering

For failed Electric Motors, Generators, and ancillary electrical and mechanical equipment such as VSDs, pumps, and gearboxes; AEMT members are the respected service provider.

IN THIS ISSUE...





AEMT

Journal

VOLUME 18 | ISSUE 1

Front cover photos:

1. KSB Sewatec Pumps for Europe's Largest Wastewater Project at Emscher Sewer Canal Pumping Stations Germany.
2. The bridge of Sulzer's 2MW test bed is functional and delivers the 'Wow-Factor'.
3. Nestech's laminations on display

ADVERTISING

For advertising please contact Sam Agnew and for editorial please contact Thomas Marks:

Sam: sam@aemt.co.uk
Thomas: thomas@aemt.co.uk

AEMT Ltd,
St Saviours House,
St Saviours Place,
York, North Yorkshire
YO1 7PJ, UK

Tel: +44 (0) 1904 674899
Fax: +44 (0) 1904 674896
Email: admin@aemt.co.uk
Web: www.theaemt.com

AEMT COMMENT

Welcome to the spring edition of the AEMT Journal – and with it we take a look at what AEMT members have been upto as well as introducing some newer members to the association.

Dr. Martin Killeen cleans the slate from any doubts over what is required from the hazardous area repair standard, 60079-19. If you are wondering how it affects your business as a user, or what it means for repairers, then this article will help you understand the ins and outs.

Keeping up appearances, Sulzer have invested in a smart new test centre in their Falkirk service centre in Scotland. I examine the reasons behind the investment, and the new facilities it brings.

With newer technologies phasing out DC machines, commutators are becoming increasingly rare within industry, however this hasn't stopped new member PLD Collettori in Italy from expanding its business. An investment in a new startup company called Nestech also means they have diversified into the steel laminations industry. In another article I look at how Nestech is achieving success and benefiting from the partnership.

Matt Fletcher will be well known for those familiar with LinkedIn, we publish an article he has written on the social media platform as he looks for help on a rare Brook Crompton pipe cage rotor.

Finally, Sam Agnew, who recently joined the secretariat as events and membership manager takes us through the highlights of the midlands meeting and a tour of the classic car company, Morgan Motors.

Thomas Marks,
Editor.

AEMT President's Welcome

Welcome to the latest edition of the AEMT journal, which is packed full of interesting articles about our industry and of course the important role played by AEMT members within it. As I write this, spring has sort of sprung and the odd sunny day is now evident as we move forwards from what has been a hard winter, weather-wise, in particular.

Having talked to many members, while the winter has indeed been hard and many like me have suffered more than usual from the cold/flu variants flying about, it has generally been a good winter for business and it is certainly true that harsh weather is normally good news for our members and provides more need for service and repair activities than a calm period. So, generally, the mood of the membership seems buoyant, with lots of work already undertaken and so a good start to 2018 behind us.

The winter has not been without the odd business casualty though and it is with personal sadness that I see the HG Rewinds group of companies now in administration. HG Rewinds are long-established members of the AEMT and have generally played an active role. Indeed, in Philip Bourne, who retired several years ago and is now an Honorary member, they provided the AEMT President during a tricky time for the AEMT and helped stabilise the organisation to move it forwards. It does serve to remind me that no business has the right to exist. Only by hard work, good luck and due diligence will businesses continue to thrive and prosper. For my part, I am keen that the AEMT continues to offer all its members useful support and real business benefits, to help all members succeed in the long-term.

I recently attended the excellent Pump Industry Awards, hosted by the BPMA, an organisation with many similar aims, beliefs and common interests as ours. Although I attended as an EMIR Software representative on the night, and congratulations to ABB who pipped us to Industry Supplier of the Year, it was good to see so many companies making the effort to enter and attend the awards, and their attendance was duly rewarded with a very enjoyable evening and a celebration of excellent engineering endeavour.

Only by hard work, good luck and due diligence will businesses continue to thrive and prosper. For my part, I am keen that the AEMT continues to offer all its members useful support and real business benefits, to help all members succeed in the long-term.

In a similar fashion, our own AEMT awards are already scheduled for November 29th at the Doubletree by Hilton Hotel in Coventry. If you didn't attend last year's excellent event, I can only urge that you look to enter an award or at least attend the ceremony, as it is a great networking opportunity and a chance to receive due praise for the excellent work you have undertaken. This year, very importantly, we will be providing a Conference during the day at the same venue, so you now have the chance to be educated and entertained in the same day! More information will be coming to you soon on what promises to be the best day's event the electro-mechanical industry has ever seen, so please keep an eye out and support the AEMT and its efforts to support you and the industry! There may still be the odd sponsorship place available too if you are keen to get involved and associate your business with such industry excellence.

The AEMT will also be running several other networking events over the summer and of course we have the AGM on June 14th at the Triumph Motorcycle Museum, so please take the time to visit the excellent AEMT website www.theaemt.com and check out the Events page. It is certainly true that you only "get out of the association what you put in", so please make an effort to attend AEMT events and you will be certainly be rewarded for your time.

Here's wishing we have a great summer and I hope to meet you at an upcoming AEMT event soon.

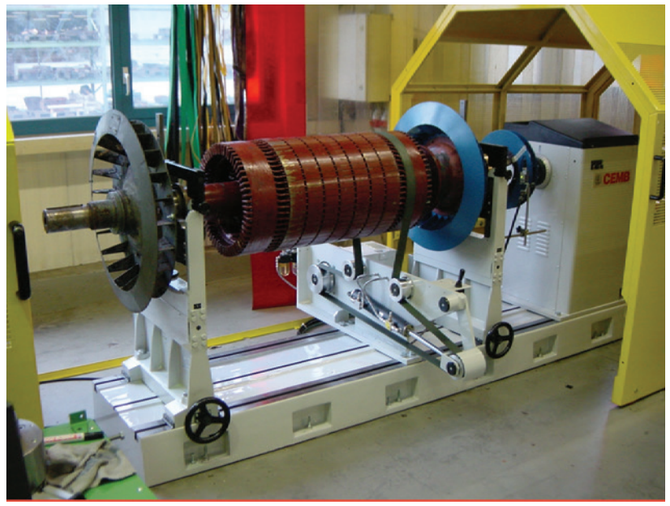
Gary Downes
President

FIND OUT MORE ABOUT

BALANCING

ELECTRIC MOTORS / FANS / BLOWERS / PUMPS / TURBINES / MOTOR REWINDS / IMPELLERS / FLYWHEELS

- HORIZONTAL BALANCING MACHINES
- VERTICAL BALANCING MACHINES
- PORTABLE BALANCING EQUIPMENT
- VIBRATION MONITORING
- MACHINE UPGRADES
- CONTRACT BALANCING
- SITE SERVICES
- CALIBRATION



- VIBRATION MEASUREMENT
- BEARING ANALYSIS
- FREQUENCY ANALYSER
- BALANCER
- TACHOMETER

CEMB HOFMANN

CEMB-HOFMANN (UK) LTD
Unit 1, Longwood Road, Trafford Park, Manchester M17 1PZ
Tel: 0161 872 3123 Fax: 0161 877 9967
Email: enquiries@cembhofmann.co.uk www.cembhofmann.co.uk

TEC

WWW.TECMOTORS.CO.UK

NOW AVAILABLE EX STOCK FRAME SIZES 355 & 400

355kW, 400kW, 500kW & 630kW SAMEDAY & OVERNIGHT DELIVERY!

Additional Features:

- B3 & B35 STOCKED
- IE3 EFFICIENCY
- 2 & 4 POLE
- FITTED WITH PTC150/PT100
- SUITABLE FOR VSD
- INSULATED BEARINGS FITTED
- RAL7024 EPOXY C5M PAINTED

TEC ELECTRIC MOTORS now stock the largest motors on the shelf within the industry.

Call now for your no obligation quotation.

B3 & B35 MOUNTING

IE3 EFFICIENCY

2 & 4 POLE

FITTED WITH PTC150/PT100

INVERTER RATED

EPOXY PAINTED

TEC Motors (HQ)
Unit 1, Building 341,
Rushock Trading Estate,
Droitwich Spa,
Worcestershire, WR9 0NR.

TEL: 01299 252990
FAX: 01299 253597

Email: orders@tecmotors.co.uk

TEC Motors (North)
Unit 2 Marrtree Business Park,
Kirkwood Close,
Penistone, Oxspring
Sheffield, S36 8ZP

TEL: 01226 767826
FAX: 01226 763781

Email: tecnorthern@tecmotors.co.uk

TEC Motors (Scotland)
Units 36-38 Deerdykes View,
West View Industrial Estate,
Cumbernauld, Glasgow,
Scotland, G68 9HN

TEL: 01236 793460
FAX: 01236 795985

Email: tecscotland@tecmotors.co.uk

TEC Motors (Wales)
Units 24 & 25, Ty Verlon
Industrial Estate,
Cardiff Road, Barry,
Wales, CF63 2BE

TEL: 01446 748832
FAX: 01446 748030

Email: tecwales@tecmotors.co.uk

Parsons Peebles all set to Install 27 tonne Engineered-to-Order Drop-in Replacement Motor on North Sea Platform

The machine is one of the largest low starting current machines to have been built in recent years by Parsons Peebles.

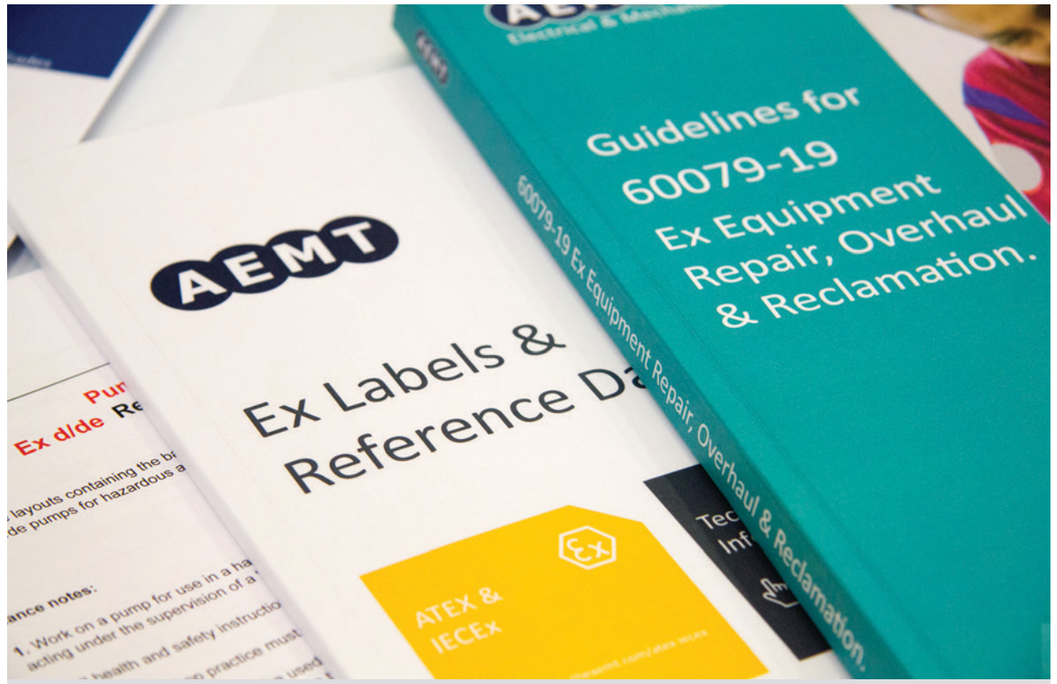
The 27 tonne motor was built for a North Sea oil platform to replace an existing unit on a gas compressor application. Standing at 3 metres tall, the 8.95 MW machine was tested on load at 8 MW. It is one of the largest low starting current machines built in recent years.

The customer selected Parsons Peebles as the successful bidder. This was based on experience and ability to provide an engineered-to-order solution that would meet the specification of the job. The principle low starting current design feature enables online start-up and takes only 15 seconds to reach its full four pole speed at 100% voltage, 11kV 60Hz.

Involving 12 personnel from design, through to manufacturing and testing, the performance of the motor had to match the electrical performance of the machine it is replacing and mechanically had to fit in the exact same footprint.

The huge machine will be deconstructed and transported in parts before being re-assembled and fully commissioned by Parsons Peebles on site.

Len Jones, Parsons Peebles Chief Engineer, said, “This project has been a tribute to the world class design capability of Parsons Peebles and the skills and experience of the staff involved. The scale of the project and engineering required to provide a suitable product for the customer’s specification is exactly the type of project we have been working on for over 100 years as a business.”



IEC 60079 is a series of explosive atmosphere standards that covers a wide array of considerations for component usage in hazardous areas, as well as defining different hazardous area classifications.

IEC 60079-19: What is it and what does it mean to me?

Dr. Martin Killeen
(AEMT Lead Lecturer and Technical Consultant)

Dr. Martin Killeen of the AEMT (Association of Electrical and Mechanical Trades) outlines the requirements of the international standard IEC 60079-19 : Repair, Overhaul and Reclamation for Hazardous Area Equipment, and highlights how it impacts on both the service provider and the end user.

Over the years we have all seen in the news the disastrous consequences of explosions in hazardous area installations. From Piper Alpha to Buncefield to Deepwater Horizon, the collateral damage and loss of life represent a cost that simply cannot be counted.

Certainly such disasters bring into sharp focus the requirement to specify compliant products for hazardous area installations, covered by international standard commissioners such as IEC Ex, and legislative frameworks such as the European ATEX directive. But what are the implications for the repair, overhaul and reclamation of equipment used in explosive atmospheres.

IEC 60079 is a series of explosive atmosphere standards that covers a wide array of considerations for component usage in hazardous areas, as well as defining different hazardous area classifications. An important section of the series specifically covers equipment repair, overhaul, reclamation and modification. This is distinct from the maintenance of equipment, other than when repair and overhaul cannot be separated from maintenance.

Ex rated equipment was first defined in the early 20th Century after a serious coal mining accident, with FLP (Ex d) or flameproof motors being the first examples of Ex rated components. In 1984, AEMT and BEAMA jointly produced a code of practice for the repair of Ex rated equipment, and in 1993 this was first adopted as a British standard and published as BS EN 60079 Part 19.

The standard was internationalised in 2004 and published as IEC 60079-19, with additional requirements during overhaul and repair of Ex equipment. Further, the updated standard removed the

Dr. Martin Killeen lecturing for the AEMT in Loughborough.

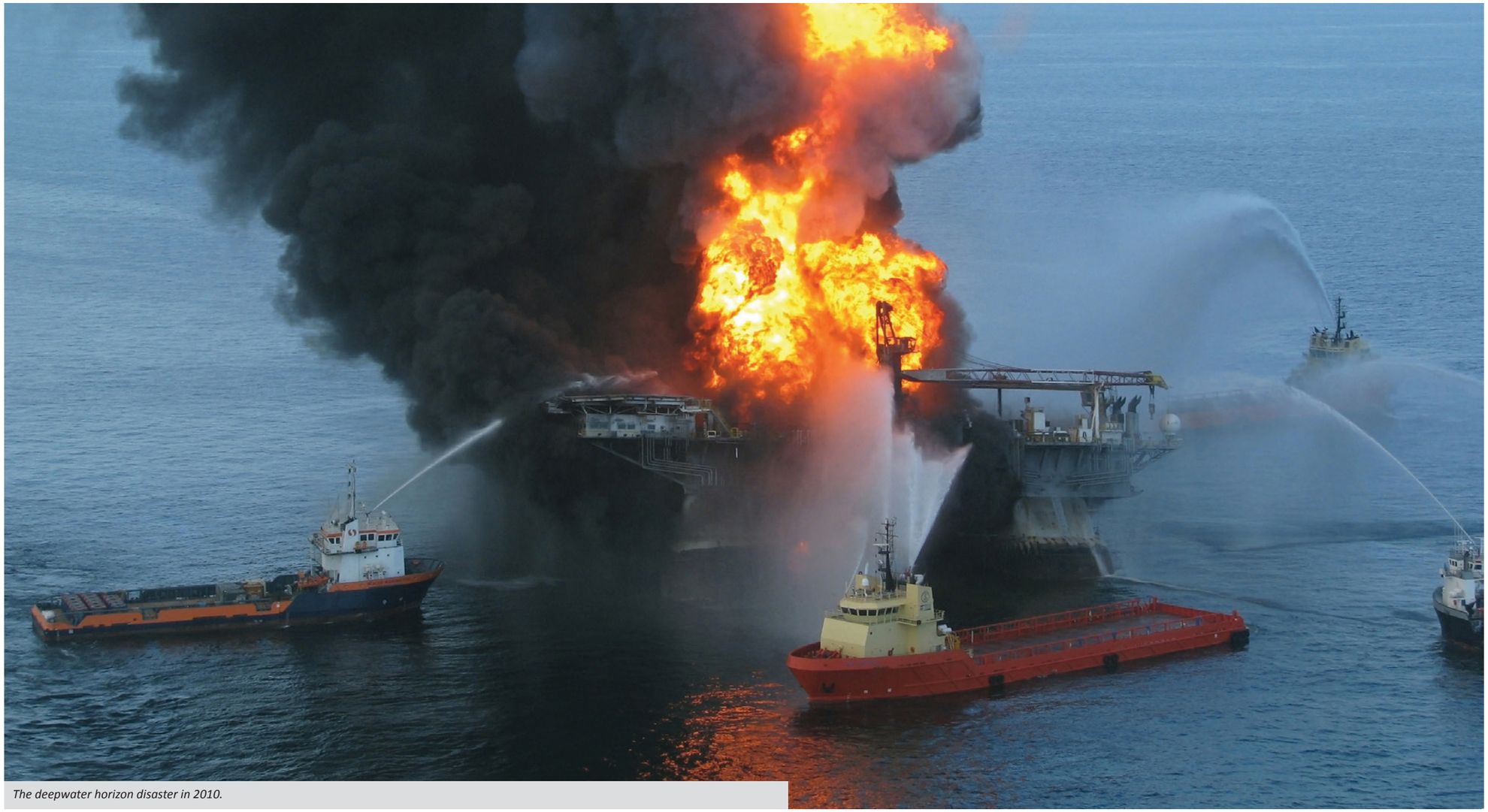
Crowds await news at the Universal Colliery, Senghenydd after an explosion in 1913.

exclusion of mining and introduced all explosive atmospheres - including dusts. It also introduced new requirements for competency of persons, and when it comes to liability in the event of an explosion, those last requirements serve to define responsibility.

Those parties charged with buying-in overhaul and repair services, and signing them off, along with those companies who are offering the services, should also be aware that IEC 60079-19 was significantly updated. These occurred in 2011, with a subsequent amendment in 2015, with the inclusion of specific Group I requirements and the inclusion of offshore requirements.

General principles

IEC 60079-19 lays down the general principles of repair, overhaul, reclamation, alteration and modification that are common to all explosion-protected equipment, with additional clauses to provide instructions relevant to specific types of protection. Assuming that repairs and overhauls are carried



The deepwater horizon disaster in 2010.

out using good engineering practices and certificate details, then the finished equipment is considered as being conformant to the original standard and the manufacturer's specification. Where this specification data is not available, then equipment can be described simply as having been repaired in conformance to IEC 60079-19 and meeting the relevant standards the equipment was designed conform to. Of course, steps taken to obtain the original specification data should be documented.

All repair or overhaul work carried out must be fully documented, and job reports submitted to the user. Repair facility records should be maintained to provide a complete audit trail of the work carried out and all of the steps taken, including measurements such as flame path or radial gap compliance.

All repair or overhaul work carried out must be fully documented, and job reports submitted to the user. Repair facility records should be maintained to provide a complete audit trail of the work carried out and all of the steps taken. Measurements such as the flame path gaps and radial gap should be recorded and conform to the relevant standards criteria. Equipment returned to the end user should be clearly labelled as having been repaired or overhauled, with the relevant manufacturing standards it meets, and the repairer identified.

Where reclamation is being carried out, this should be performed by competent personnel. Ultimate responsibility falls under the repair facility, even if reclamation work is out-sourced to a third party. It should be noted that not all procedures are applicable to all types of protection, and IEC 60079-19 gives detailed instructions on what can and cannot be reclaimed.

Where equipment is to be modified rather than repaired, then either alterations need to be specifically permitted in the certificate documentation, or the proposed alteration needs to be authorised by the manufacturer, in writing, to be permitted by the certificate.

If a modification means that the equipment can no longer be confirmed as meeting the original certified specification, then the user needs to be notified in writing, with a report stating that the equipment cannot be used in an explosive atmosphere without additional assessment.

Temporary repairs to achieve continued short-term operation of equipment can only be carried out if it can be demonstrated that explosion-protection capabilities are maintained or if other appropriate explosion-protection measures are taken. Any temporary repair should be brought up to full repair standards as soon as possible.

Additional requirements

A key section of the standard details additional requirements for the repair and overhaul of equipment that is Ex d rated. The standard focuses on requirements for enclosures, cable and conduit entries, terminations, insulation, internal connections and windings (including repair of rotating machine rotors). Detailed instructions are also given on a number of testing processes for windings after any repair, which should be completed as far as is reasonably practicable.

There is also a host of additional requirements for the likes of flameproof brakes, other auxiliary devices, light-transmitting parts, encapsulated parts, batteries, lamps, lampholders, ballasts and breathing devices.

A further section within the standard goes on to detail additional requirements for the repair and overhaul of equipment rated as intrinsically safe (IS). This focuses on equipment such as enclosures, cable glands, terminations, soldered connections, fuses, relays, shunt diode safety barriers, PCBs, optocouplers, electrical components, batteries, internal wiring, transformers, encapsulated components, and non-electrical parts. Not all of these parts are able to be repaired, and should simply be replaced. Where equipment is repaired or overhauled, the work should be followed by testing of the dielectric strength of the insulation between the intrinsically safe circuit and the metallic enclosure.

No attempt at reclamation should be made on components on which intrinsic safety depends. Any aleration of equipment needs to be considered as a modification to the complete system from that shown in the IS documentation, and a reassessment should be carried out by a qualified third party – specifically, then, not the company which made the modification.

Inspecting and measuring flamepaths on an Ex d machine is an important aspect of their repair.

Another clause within the standard details requirements for the repair and overhaul of pressurised equipment. While it is preferable to obtain new parts from the manufacturer, in principle damaged parts such as enclosures can be repaired or replaced. Detailed instructions are provided as to what can and cannot be done with the likes of enclosures, cable and conduit entries, terminations, insulation, internal connections and windings, along with instructions for testing after the repair.

While Ex d, pressurised and intrinsically safe equipment will probably represent the bulk of the most safety-critical repair and overhaul work in hazardous areas, the scope of IEC 60079-19 is more comprehensive, offering detailed instructions for the likes of equipment with protection type ‘e’ (increased safety), type ‘n’, Group III ‘t’ (Dust), and type ‘pd’ (pressurised).

Responsible persons

A very important section of IEC 60079-19 to be aware of is Annex B, which defines the knowledge, skills and competencies of ‘responsible persons’ and ‘operatives’. Responsible persons are those who are responsible for the processes involved in the overhaul, repair and reclamation of the types of explosion protected equipment as defined within the standard. These responsible persons should confine their involvement to overhaul, repair and reclamation, and should not be involved in modification without manufacturer's guidance.

Any repair facility must appoint a ‘responsible person’ with the required competencies within the management organisation, to accept responsibility and authority for ensuring that the overhauled/repaired equipment complies with the certification status and work carried out has been agreed

We can see then, that the requirements of IEC 60079-19 are extremely stringent, and measures that were once guidelines and a recommended code of practice are now highly prescribed legislation.

with the user That person must have a working knowledge of the appropriate explosion protection standards and an understanding of this standard. This requirement means that it is the responsible person who takes the final decision that Ex Equipment is in compliance and can be returned to the customer.

Operatives, as defined in the standard, who will be working on equipment and who may be taking decisions that would have an impact on the certification status of the Ex equipment, need to work under the surveillance of the responsible person. All operatives involved in the overhaul and repair processes need to be independently assessed at regular intervals as competent to IEC 60079-19 and need to be aware of the requirements of the standards.

The service facility of course has a responsibility to demonstrate compliance with the requirements of IEC 60079-19, but importantly there is also an onus on the user to ascertain that the service facility can indeed demonstrate compliance. In the event of any problem with repaired, overhauled or modified equipment, investigation bodies will look for evidence of due diligence from both parties.

We can see then, that the requirements of IEC 60079-19 are extremely stringent, and measures that were once guidelines are now required to be able to conform with the mandatory Atex directives and other legislation. However, in areas with potentially explosive atmospheres, the stakes are high and the potential for the next Buncefield or the next Piper Alpha is never far from our minds. ■

The bridge of the 2MW test bed is functional and delivers the 'Wow-Factor'.

Sulzer delivers the 'Wow-Factor' with 2MW Falkirk test facility.

Thomas Marks
(AEMT Secretary)

Like a stack of cards growing higher and higher – the Sulzer Falkirk test bed was becoming increasingly unstable. Hemmed in by legacy brick walls and 25 years of modifications and add-ons, meant it was time to bite the bullet and rebuild the service centre's testing capabilities from the ground up.

On January 25th the workshop doors were flung open to welcome selected guests and customers to view the shiny new test bed. It was clear that it had been designed with 'wow factor' in mind. The days when workshops were built for purely utilitarian purposes are clearly over, as visitors look to be impressed with the cutting-edge facilities.

Besides the fresh white paint opening up the workshop space after decades of gloomy dark walls, the glass walled test centre housing an über stylish control centre and customer reception cannot fail to impress. The sleek LED-lit control centre wouldn't look out of place in the Starship Enterprise, whose bridge looks out onto a generously sized 2MW test bed.

Keeping in control

It would be prudent to wonder whether there is a need for such an extravagance. After all, can a motor load test not be done onsite, where the machine can be put against real running conditions? Static tests can be run to check winding resistance, insulation resistance and surge comparison test to test the stator of the machine.

800 kW load capacity can be used for testing vertically-orientated motors, across a full range of voltages from 400 V up to 11 kV at both 50 and 60 Hz.

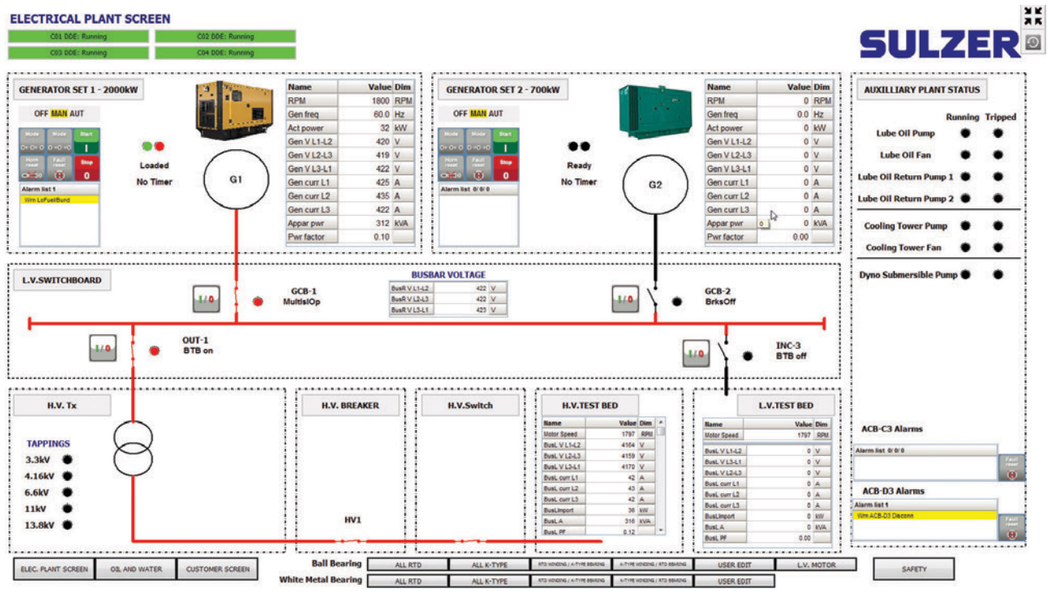
When checking a machine under full load, a much more comprehensive picture of the motors required performance can be built up. The test is particularly relevant to check critical machines that are going to be difficult to return to the workshop after fitment either due to location, confined space, lifting gear requirements, shipping, offshore etc. Tests can include efficiency, noise and temperature rise measurements, indirect load tests, excess current, torque tests, and torque/speed tests.

Sulzer has invested in a controlled environment. On site testing where the environment cannot be controlled, will throw up a lot of uncertainties in the readings, leading to unreliable results. Getting a machine up to normal running temperature can take 4 to 6 hours, and to keep a machine on full load on site could be difficult.

In a controlled environment, the ambient temperature is known, while the load can be accurately applied. There is also the benefit of being able to test the equipment for a full working day or over an extended period.

More importantly – the test bed's stiffness is known and factored against the machines vibration and noise levels, whereas on site vibrations would cloud the results. Another aspect to consider is being able to measure the temperature of the windings within 2 minutes of stopping, which is much, much, easier to do in a controlled environment, resistance temperature detectors don't always give the complete story.
As part of the upgrade project, the test area was equipped with the latest monitoring controls and safety equipment, providing the test engineers with remote visualizations of the sensor readings, while protecting them from the large rotating equipment.

A comfortable customer viewing area is also available, from where they can watch and interact with the test engineers before hand over to ensure that the machine meets the required performance levels. The entire process is transparent and straightforward.



The new investment adds a 2,000 kVA and a 700 kVA generator to the site synchronized through a 4,000 Amp low voltage switchboard, as well as a new 2,500 kVA transformer, doubling the capacity of the test bed.

Facing the Challenge

Despite the understandable challenges of keeping the facility running without disruption while major works took place; there were many options to decide upon when designing the new system to satisfy customer needs and be a showcase for Sulzer.

Falkirk is used to seeing a mix of offshore motors from the oil and gas industry, which usually operate at a 60Hz frequency, whereas onshore equipment runs at 50Hz meaning a dual or variable frequency system was required.
A wide variety of voltages from 400V to 13800kV had to be catered for, as well a variety of speeds from 2 pole to 8 pole. The testing of back to back, multiple motors, vertical motors, old machinery, and induction motors, were all further challenges to overcome.
When it came to engineering the test bed's capabilities of handling induction motors, frequency variations needed to be accounted for. A standard grid power supply of 50Hz fed through a transformer provides a variety of voltages to the induction motor. Due to slip, the motor runs at a slightly lower frequency meaning the power from the generator running at 1485rpm gives only 49Hz, which of course, can't be put back into the grid.

The new installation increases the load testing capacity to 2,000 kW for horizontally-orientated motors as well an increase in voltage to 13.8 kV.

There were two solutions considered to handle induction motors. A variable speed drive (VSD) could be used to bring the frequency back up to 50Hz for the grid. VSDs can cause spikes in voltages that modern motors are designed to handle, yet older equipment would not. VSDs also create additional harmonic, noise, heating and vibrations which will affect test results.

A more reliable option was to choose a fixed frequency diesel generator set fed into the test facility from outside, offering a constant sine wave without any voltage spikes. The controlled conditions mean momentary overloads can be handled and starting currents can be monitored for asynchronous machines.

Doubling capacity

Until now, the Falkirk site used a 1,250 kVA diesel generator operated through two step-up transformers to provide 3.3 to 11 kV via high voltage switchgear to the test bed. The new investment adds a 2,000 kVA and a 700 kVA generator to the site, synchronized through a 4,000 Amp low voltage switchboard, as well as a new 2,500 kVA transformer, doubling the capacity of the test bed.

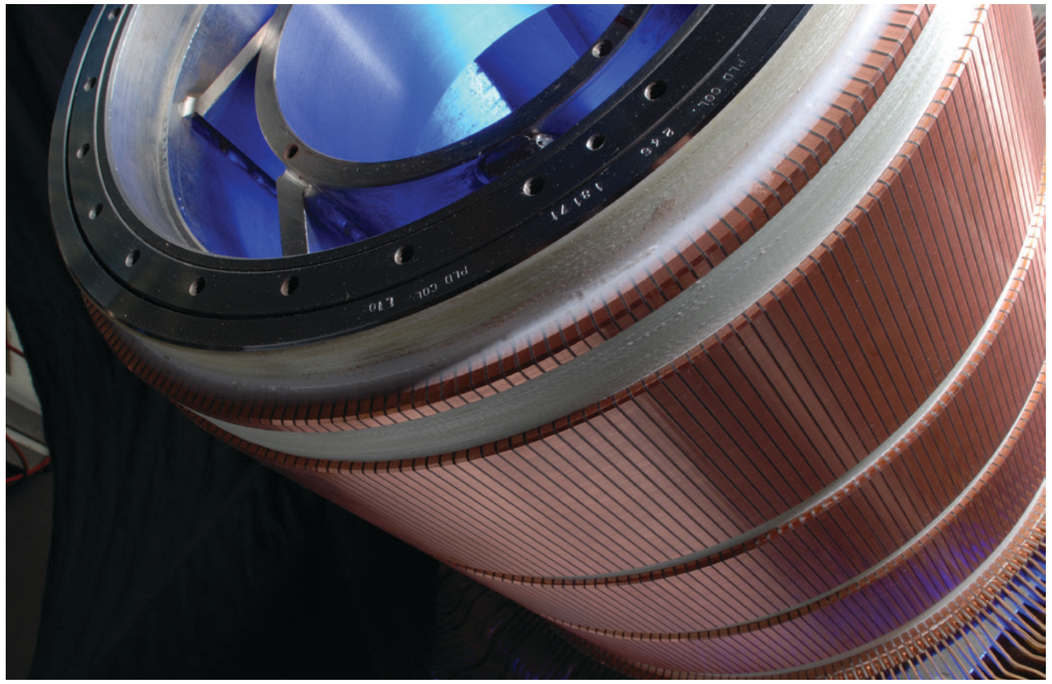
Of the original 1,000 kW capacity in load testing, 800 kW can be used for testing vertically-orientated machines, across the full range of voltages from 400 V up to 11 kV at both 50 and 60 Hz. The new installation increases the load testing capacity to 2,000 kW for horizontally-orientated motors as well an increase in voltage to 13.8 kV. Most of the equipment tested in the increased capacity will be large, high voltage, AC motors, but the possibility to test DC motors up to 600 V, with a loading up to 800 amps remains.

With the expanded test-bed in place, multiple motors can be tested alongside each other. Meaning if the testing of one motor needs to be extended, other projects won't be held back.

The new test bed also offers the possibility of load testing generators using a slave motor to turn the generator and connecting the output to a load bank. In this way, generators having undergone major repairs, can be tested to ensure that they are fit for purpose before they are re-installed and recommissioned. ■

The controlled conditions mean momentary overloads can be handled and starting currents can be monitored for asynchronous machines.

Chris Powles, Head of Electro Mechanical Services (EMEA), welcomes guests to the Falkirk open day.



PLD Collettori Commutators – Copper, Steel, Mica and lots of experience!

Thomas Marks
(AEMT Secretary)

Nestled in the foothills of the Italian Alpes just a 1 hour drive from Venice, sits the head office and workshops of two recent members to join the AEMT. PLD Collettori produces commutators for the electric motor sector, and Nestech, a startup producing laser cut stack laminations for electric motors.

Background and Capability

Luciano Pesavento and his brother Dino acquired the 80's formed Veneta Collettori company in 2002 along with their workshop assets and equipment based in Valdastico, Northern Italy. Placing their initials PLD before the company name to form the company of today.

Luciano is the mechanical engineer of the two brothers. His strong points may not be English, however with many other English speakers in the company for the international market, this isn't a problem. His entrepreneurial spirit, and acute understanding of mechanical engineering, inspired by his love of classic cars, means the company is thriving. Dino compliments his brother's mechanical strengths as an electronic engineer and has the same passion for business. He now also manages his own carbon composites company called Carbonveneta, most likely inspired by working in their father's construction company.

When they bought the company, PLD's customer base came purely from the Italian market. A major customer of theirs at the time was the manufacturer Ansaldo (now part of Nidec). The last 16 years has seen the brothers expand and invest wisely in innovation, engineering capabilities, and business (Nestech). The company now has major contracts with Trenitalia Transport group, and exports between 70-80% largely to the European market, as well as the Middle East and Turkey. They supply a full range of traction and industrial commutators from 250/800mm right up to the more bespoke 2000mm.

Their small size, but multinational philosophy means they can offer a

Left to Right) Luciano and Dino Pesavento of PLD Collettori, Roberto Movio of Nestech.

personalised service to manufacturing companies looking to find solutions through prototypes, engineering companies looking for replacement commutators for old equipment, or any bespoke design.

With over 30 years of niche experience, PLD can be a welcome partner to draw knowledge and know-how from. Their expertise covers the range of technologies in use, calculating dynamic stresses, material selection, equipment design, assembly methods, and stabilization. An internal design department works with 3D CAD drawings to accurately produce a virtual design, which, when finalised, is also used to develop the jigs required for forming the commutators with great accuracy.

Incidentally, these jigs are also manufactured in house, contributing to their philosophy for quick-response-manufacturing. Combined with an inhouse copper drawing capability, means Luciano's team can produce high quality commutators in-house, without the unpredictability and lead times from external suppliers.

Testing the dimensions of a commutator while machining to size.

Creating Commutators

Variation in commutator designs, means the design and construction is a skilled task. Whether replacing a commutator like for like, or designing a bespoke dovetail, glass-banded, or steel shrunk design, their understanding of the manufacturing methods can help.

When replacing a commutator like for like, it helps PLD if you have the original manufacturer's certificate, drawings and dimensions. If these are not available, PLD can work with you to understand the application of the equipment and come to a suitable work specification for the grade of materials to be used. In addition to this, material grades, and modern manufacturing methods mean that mechanical strengths in the commutator can be improved. This might be required if the machine is to operate at higher speeds than originally specified.

The way the commutator bars and mica insulations (segment packs) are mounted onto the steel hub defines the type of commutator, all their methods are designed to apply considerable counter force to hold the bars together despite the high speed centrifugal forces.

Dovetail or V-ring commutators are the most common method of mounting and are used in most applications. A V-shaped notch is cut in the front and back of the commutator bars. A corresponding V-shaped ring, insulated with mica, holds the commutator together. When clamped, tension forms between the bars and rings, drawing the commutator bars inwards. When designing this mounting

Head office and workshops nestled in the foothills of the Italian Alpes.

method, an experienced designer allows enough bar height to accommodate the v-notch without weakening the bars. A shallow V-notch, designed incorrectly, will allow bars to lift in operation, which will lead to a failure.

Glass-banded commutators are lighter in weight and require less maintenance. The segment pack compression is retained on the exterior of the commutator by cured glass banding applied in grooves adjacent to the brush track. These banded commutators, which lack clamping, means they cannot be checked for tightness in the same way as the dovetail configuration. However, by tapping each segment and listening out for the 'ring,' ensures the bars have remained rigid.

Steel shrink ring commutators are designed for extreme duty applications and can withstand rapid acceleration and high speeds. The technique for shrinking-on is more modern than that used for dovetailing. The copper alloy body, which is held together by glass banding, is shrunk into an insulated steel body to give a single compact piece. This can reach high rotational speeds, even for very long commutators.

Moulded commutators are typically smaller, less expensive, for high series production. The equipment is not usually repaired; which is why PLD Collettori do not produce them.

Finally, before shipping the finished commutators, several quality checks are carried out resulting in an impressive 1.8 x 1000 production defect wastage. Checks include: testing of dimensions, insulation resistance with a dielectric or hipot test, commutator hardness (Brinnel Test), measuring resistance to mass, heat seasoning of the commutator through various operating cycles, and an over-speed centrifuge test.

Next for PLD Collettori

PLD Collettori sits comfortably in a niche market, for which there is very little competition in Europe. Luciano takes great pride in the quality of the work they produce and hasn't any concerns about the future of the DC Commutator sector. Although an aging technology, there is plenty of room for business in other countries. The repair industry is becoming a large revenue generator for the business now, so their joining the AEMT network comes at a strategic time.

Luciano and Dino's partnership with Roberto Movio and Nestech was formed after exhibiting at CWIEME in 2013. Roberto was representing a steel cutting company close to PLD Collettori's booth. After getting to know one another better, they realised there was a clear synergy in their expertise and networks. To support Roberto in the startup of Nestech, has meant PLD can reduce their overheads by sharing equipment, and improve parts of their own steel lamination production. Where the expanding companies go in the future, is too early to say, but for now the synergies and co-operation between these two companies is working very well.

For enquiries, contact Dino or Roberto on +39 0445 745097 or on email by info@pldcollettori.it. Their website can be found at www.pldcollettori.it ■

PLD Collettori pride themselves on being one of the only commutator production companies with an inhouse copper drawing machine.

Roberto Movio (second from left) with his partners, Nestech colleagues, and employees of PLD Collettori in the shared workshop.

Nestech laminations stack up for the aftermarket

Thomas Marks
(AEMT Secretary)

Roberto Movio's interest in electrical engineering stems from his love of music. From a young age he would be tinkering with effects pedals for his electric guitar, which drew him towards a degree in electronic engineering later in life at Udine University, Italy. His career has seen him work as a flight simulator technician for the Tornado aircraft with Thales Alenia, after which he built up over twenty years of experience in the sheet metal cutting industry for stator and rotor core stack laminations and assembly.

It was at this point that Roberto came across the company PLD Collettori, while exhibiting at CWIEME in 2013. An instant friendship was made with company directors and brothers Luciano and Dino Pesavento. Roberto was ready to start making steps towards setting up his own company, and the Pesavento brothers realised the advantages in becoming partners with Roberto, whose experience neatly complimented their commutator business.

In 2017, Nestech srl was setup, and Roberto moved into PLD Collettori's facility near Valdastico, with two additions to the works team for machining and assembly.

Nestech has positioned themselves to offer laser cut laminations for poles, stators, rotor cores, linear motors, transformers, and stirrer stacks completed with windings, shafts, and fabricated housings if requested. Applications for Nestech's products vary widely from prototype traction motors in the automotive industry to rotor/stator replacements in the repair industry. The choice for focusing on laser-cutting over stamping was clear to Roberto; he has placed himself within the one-off to small batch market, his main competition is from in house laser cutting equipment. There are very few laser cutting companies within Europe who also offer a completed stack ready for assembly.

The company is young, but they already enjoy the use of a factory with an ISO 9001 quality management system and a 14001 environmental management system in place, thus meeting the requirements of high profile organisations in their client list such as Nottingham University and a major car manufacturer.

With customers in the renewable energy sector and energy efficiency markets has led Roberto to reflect on his own social responsibility. He has taken great care to adopt sustainable practices not only in production, but also in respecting his workforce, his suppliers, and customers with equal measure. The flexibility of a small workforce means fulfilling these promises is easier than for larger organisations.

Capabilities

Sharing PLD Collettori's workshop equipment means Nestech can manage products from a 200mm to 2000mm diameter with lengths up to 3000mm. The facility is also advantageously placed within the engineering belt of Italy stretching inland from Venice. Strategic partnerships have been made with skilled locals, meaning Nestech can also supply pole and stator stacks complete with windings.

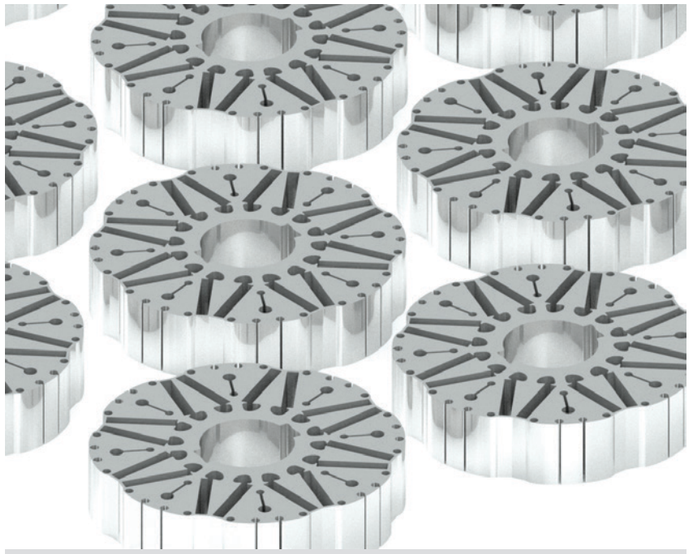
Roberto has carefully curated a range of high quality, cutting-edge, suppliers from his contacts within the sector for producing his laser cut laminations. Utilising PLD Collettori's 3D CAD department allows the company to work with customers to produce accurate drawings, and his expertise in the latest technologies means customers can rely upon his advice for material composition, and assembly options.

For the repair market, Nestech can reverse-engineer rotor and stator stacks, although original documentation offering dimensions and material grades is important to get an exact replica. If, however, the specification is to enhance the apparatus's speed or efficiency, then by drawing on Nestech's extensive experience, a solution can be developed with more modern insulation and material grades, improving the mechanical properties of the replacement product.

Once the final design has been signed-off – the CAD drawings are sent to their laser cutters, while Nestech's technicians start work on the jigs required to hold the laminations together for pressing.

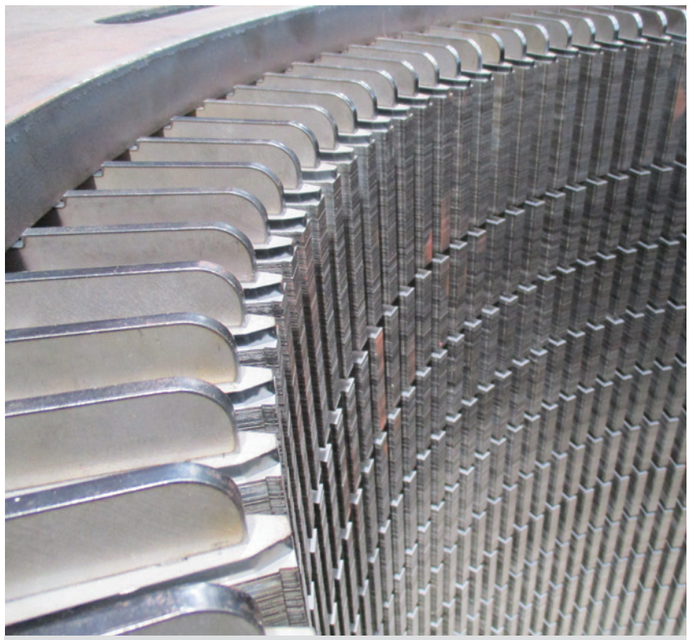
Backlack bonding

There are many ways in which the laminations can be insulated, stacked and pressed together. A current technology trend in the last few years is a varnish bonding called "backlack". The technique significantly improves the mechanical strength and magnetic flux of the finished product over past techniques such as crimping, riveting, or welding.

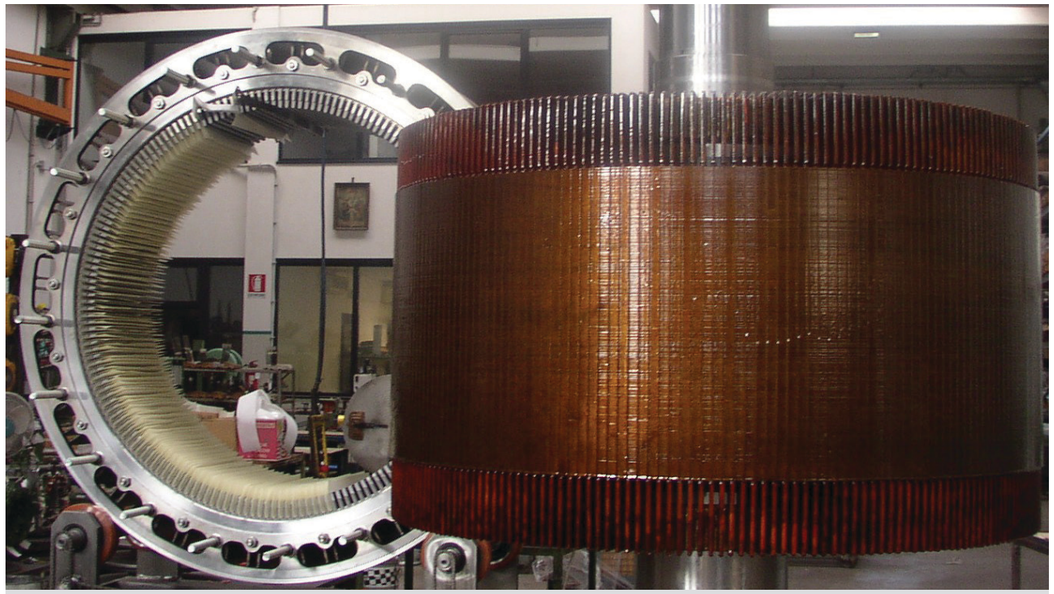


Rotor stacks of different sizes, assembled and machined to ensure tight tolerances. Such stacks can be welded, glued or riveted and have copper bars and glued permanent magnets. On request, the Company is able to provide rotors shafts.

Roberto has carefully curated a range of high quality, cutting-edge, suppliers from his contacts within the sector for producing his laser cut laminations.



Stator stacks up to 2000mm can be manufactured and assembled with tie rods and end plates, machined and/or turned to ensure tight tolerances. Stacks can be welded or glued, with screw slots, complete or in sections. On request windings can also be installed.



Nestech's in house machining capability means Roberto can produce products up to 3000mm long and between 200-2000mm diameter.

The jigs produced in-house at Nestech ensure tight tolerances are maintained when pressing stacks together.

An insulating and bonding varnish is applied to both sides of the silicon steel lamination before cutting. Once assembled into a stack using a bespoke jig, pressure is applied and the product baked in the oven at 200°C to form a strong insulated bond. The resulting stack provides many improvements such as:

- A stiffness which means the stack can be easily, and accurately machined to tight tolerances, and stator segments can withstand heavier loads than usual without deforming.
- Compared to crimping or welded seams, the improved insulation of backlack bonding overcomes short circuits, which can be caused during welding, leading to better magnetic properties and less losses as a result.
- A tight bonding between laminations minimises vibrations and noise.
- The laminations don't breathe under temperature variations, so corrosion is prevented.

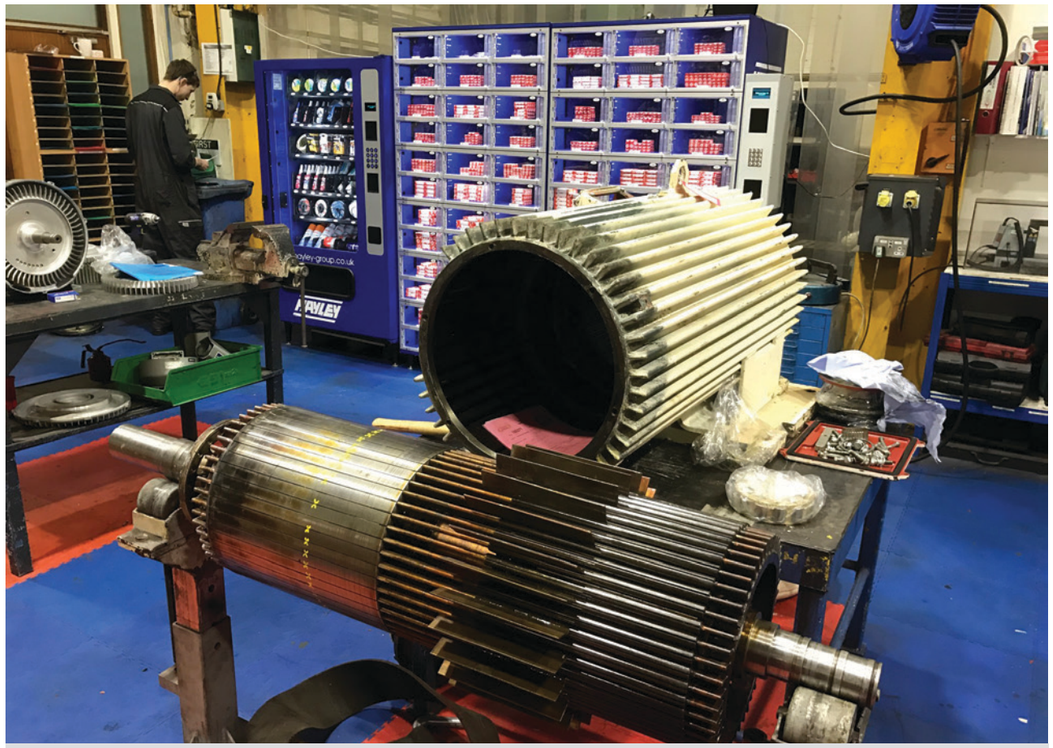
Although a superb technology, backlack is not always desirable. For instance, in larger sheets, or for complex laminations with a small surface area to glue, it is still preferable to weld, bolt or rivet the laminations together.

Once pressed, the stacks will require machining to the final dimensions and are prepared for any further requested work. Before shipping, a dielectric or flash test checks the completed stack for sound assembly, guaranteeing a quality product on delivery.

What's in the pipeline?

The Nestech partnership is in its early stages and there is still plenty of work on building business. Whether PLD Collettori and Nestech will combine to offer their services together or separate as Nestech grows more independent is too early to say. For the time being, the symbiotic relationship has really helped propel Nestech into success. Nestech is developing customers in the UK, as well as with universities and electric motor research and development centres. If you have a motor design that needs prototyping, or a need to enhance a machine with a new stator/rotor, then Roberto will gladly help you through the process.

Contact Roberto on +39 0445 745072 or email him at info@nestech.it ■



A rare Brook Crompton pipe cage rotor in for repair at Fletcher Moorland.

Have you ever seen one of these motors before? It turns out most people haven't either!

Published on LinkedIn by Matt Fletcher - Owner & Managing Director at Fletcher Moorland Ltd

I've written this article in response to the interest shown from the LinkedIn community to a photo I posted. The photo was of a rather strange looking rotor. It was from a two speed 4 & 8 pole, Brook Crompton 7-series AC machine.

On first viewing you can see there are air agitation fins on the extended cage and what looks to be another alloy cladding the extended cage. I've had 35 years in and around the motor repair business and this was the first time I've seen such a machine. So, how does one find out about such a machine in this day and age? Well turn to the LinkedIn community of course!

'Many comments were made about the rotor and it was quite clear that this was a rather rare and unusual machine indeed!'

A handful of people recognised that it was a Brook Crompton pipe-cage-rotor machine. It's the first time I've heard 'pipe-cage-rotor' too.

With the networking power of LinkedIn, there was one person who knew these machines very well indeed. Steve Cockerham (now Director at HPC Laser Ltd), who used to work for Brook Crompton. Steve provided a wonderful description of the motor and how the pipe-cage works provided in the description below:

'That's a Brook Crompton pipe cage rotor, or as they were otherwise known an "integral eddy current inductor" which was essentially a relatively unsuccessful, if very novel attempt at a cage motor which replicates the starting performance of a wound rotor or slipring machine. Typically low starting current and high starting torque, figures like 225% LRT (Locked Rotor Torque) and 400% LRC (Locked Rotor Current) were typical and they were intended for mills, crushers etc.

The silvery core on the left is the rotor core and there will be an equivalent stator core in alignment. The section on the right is a series of steel pipes which extend from the core and are both supported and shorted out by spidered steel discs under the pipes.

The stator will be half empty with a very short core, this accommodates all the pipe arrangement on the right. The flaps of steel welded to the pipes are wafters purely for stirring the air around the stator.

So the copper bars pass right from the shorting-ring on the left, through the core, through the pipes and to another shorting-ring on the far right.

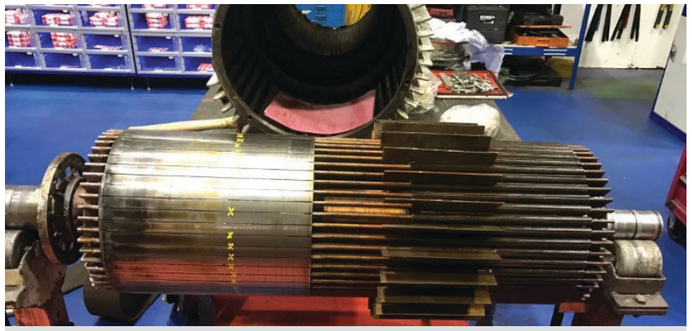
The clever thing is that the resistance of the steel pipes is proportional to the rotor frequency and so directly proportional to speed. So with high resistance at standstill, as the rotor accelerates the resistance drops and the torque characteristic gradually drops to that of the copper cage with minimal influence from the steel pipes.

A really novel design which never really took off, I'd be surprised if they managed to get into 3 figures of units in production. The pipe cage assembly acts as a series of individual short circuited transformers with the rotor bars as their respective primary windings. The pipe forms both the core and secondary winding of these transformers which are short circuited by the supporting discs.

The pipes are made of steel and therefore exhibit a high electrical resistance which is further increased when the primary (ie rotor) current is at mains frequency. This is due to skin effect, which makes the effective pipe resistance dependent upon rotor frequency and hence motor speed.

At start, with rotor current at mains frequency, a longitudinal current flows in the pipes and adds impedance to the rotor circuit. Both the resistance and inductive components of this impedance are dependent upon rotor current and frequency, and therefore decrease as the motor accelerates to full speed.

It is this automatic adjustment of impedance that gives the pipe cage rotor its torque, current and speed characteristics. Starting current is decreased at start in comparison with a normal cage machine and the additional resistance increases the starting torque.' Thank you Steve Cockerham for your knowledge and thank you LinkedIn for connecting engineers to share knowledge. ■



The rotor lamination pack on the left-hand side, and the cage extended right to a length greater than the lamination pack.

Air agitation fins on the extended cage.

Alloy cladding on the agitation fins.

Matt Fletcher can be found on LinkedIn and regularly posts articles similar to this.

Follow Matt on this link:
https://www.linkedin.com/in/mattkfletcher/

Quartzelec provides seamless support for the Royal Navy

Significant work to propulsion motors helps keeps the fleet at peak effectiveness

Throughout 2017 Quartzelec, the independent engineering service provider that's globally recognised as an expert in rotating electrical machines, has continued to actively support the Royal Navy via contracts placed by the MOD, Babcock Marine and BAE Systems, and this work is set to continue this year.

Often operating under challenging circumstances, Quartzelec has supplied the MOD with spare parts for Type 23 frigates and landing platform docks HMS Albion and Bulwark. This has demanded extensive research to locate or supply suitable alternative parts, as in some cases the solutions were to replace obsolete systems or sometimes the original equipment manufacturer (OEM) itself no longer exists.

Work has been carried out at the Royal Navy's main home ports of Portsmouth and Plymouth and occasionally abroad to support all classes of warships and support vessels in active service many of which are T23 Frigates - known as 'Duke Class' – all being named after British Dukes. This included inspections, equipment cleaning, routine maintenance and breakdown investigations and repair. In one instance Quartzelec provided diagnostic advice to a vessel deployed operationally East of Suez, which was manifesting multiple problems. Aided by Quartzelec's support and expertise, the ship's crew were able to investigate and order parts, resulting in repairs being made without interruption to the vessel's deployment.

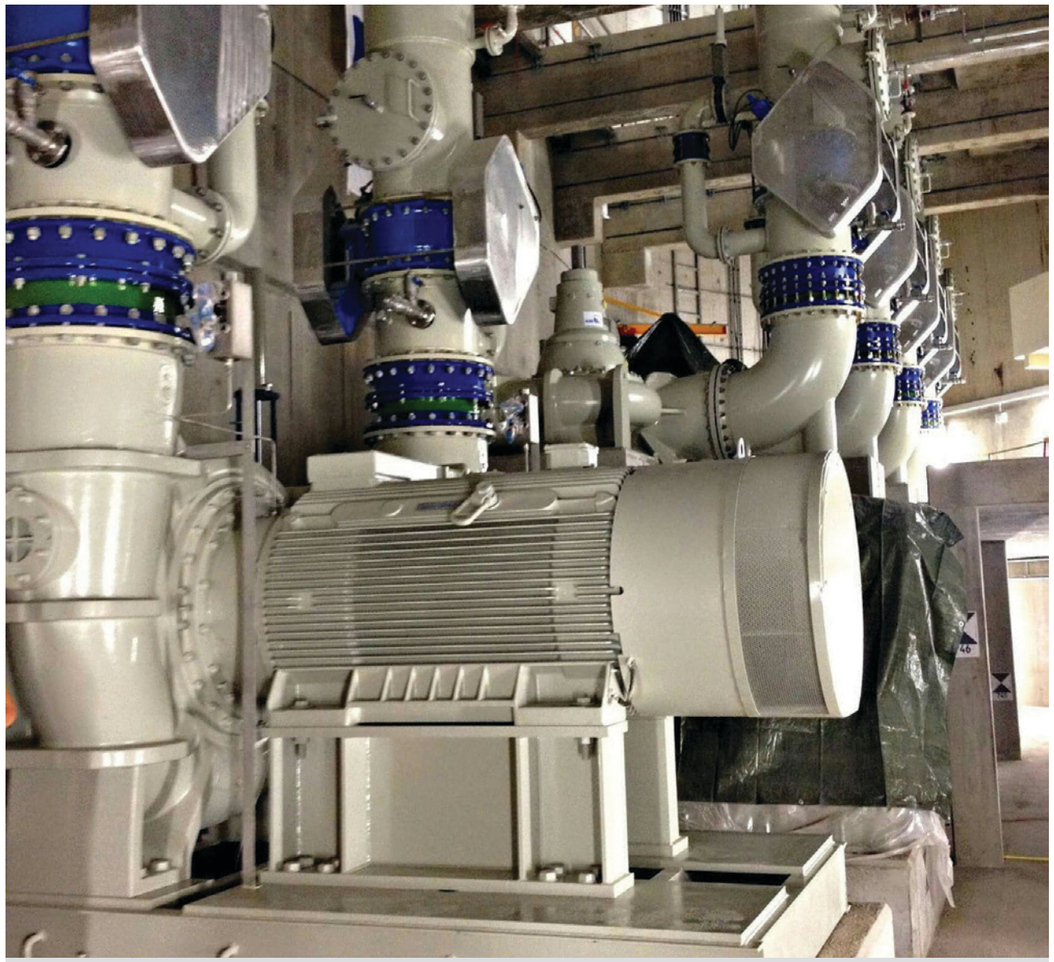
In another example of Quartzelec's wide skills base and flexibility, it was involved in defect investigation and rectification of a mine hunter bow thruster drive system. This was achieved by gathering defect information, subcontracting the OEM and attending the ship with them at HMNB Clyde in Faslane. The age and condition of some of the equipment had taken its toll, demanding replacements or alternatives which were not readily available. However, the ship was subsequently successfully deployed to join a NATO task group.

Meanwhile at Quartzelec's Grimsby facility, winders are currently in the process of winding the Control Rod Drive Mechanism (CRDM) stators for the Naval Nuclear Submarine Section in a dedicated clean room and personnel at its Aberdeen facility have been working with Stone Marine, overhauling T23 frigate anchor capstan motors.

"We have a wealth of experience working with maritime propulsion motors and are proud to be able to support and work alongside our armed forces," stated Jeff Lloyd Quartzelec's Project Manager and ex-Royal Navy. He also recently received on behalf of the Quartzelec team, a Bravo Zulu email (The naval signal for 'Well Done' and a formal compliment) from HMS Monmouth's Marine Engineering Officer for its out of hours support and the assistance given while the vessel was deployed in the Gulf. A shining example of service beyond the call.

Jeff continues: "We were delighted to receive the Bravo Zulu. Our long and prestigious heritage stretches back more than 100 years and over the past few years we have steadily built our working relationship with the Royal Navy along with key defence contractors by successfully delivering an increasingly complex schedule of critical maintenance projects. This experience is also enabling us to expand our activities in support of the oil & gas plus wider maritime sector."

Quartzelec has also just pledged its support to UK servicemen and women by signing the Armed Forces Corporate Covenant, an industry wide initiative that ensures fairness and equal opportunity for Service and ex-Service personnel, Reservists and their families. ■



KSB Sewatec Pumps for Europe's Largest Wastewater Project at Emscher Sewer Canal Pumping Stations Germany

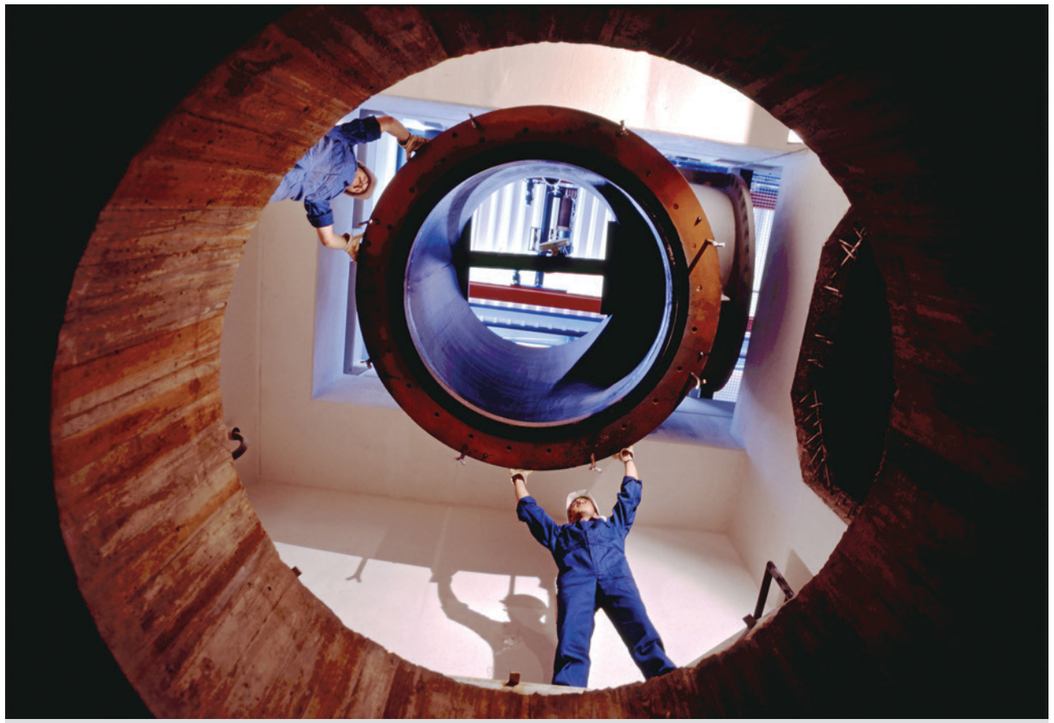
Efficiency Or Reliability? Selecting Pumps For A Colossal Pumping Station

The challenges of Europe's largest waste water project – the Emscher conversion - and the aspects that influenced the pump selection for three colossal underground pumping stations.

Restoring the highly polluted Emscher River between Dortmund and Dinslaken in Germany is Europe's largest wastewater clean-up project costing an estimated 4.5 billion Euros.

The construction project involves converting the Emscher system from an open to a closed waste water discharge system as part of a mega re-naturalisation program.

More of an open water sewer than a river, the 80km of water passes through abandoned coalmines, industrial wastelands and urban areas. The regeneration project is due to complete



Two KSB employees lower a tubular housing into a drain.

in 2020, and has faced many major challenges, ranging from collapsed coal mining tunnels, unexploded bombs, archaeological sites, and the logistics of getting the waste water to flow down the newly constructed main sewage tunnel. This latter challenge could only be made possible by the construction of three colossal underground pumping stations to lift the waste water.

This article looks at the challenges faced by Emschergenossenschaft, the organisation responsible for the Emscher River Basin, and the aspects of the project that influenced the selection and specification of the pumps needed for such a highly ambitious undertaking.

The Emscher Conversion project

To fully appreciate the project's pumping requirements, one needs a full picture of just how large and complicated the Emscher Conversion project has been. Far from being a simple river clean-up, the project has had to address the crumbling infrastructure through which the highly toxic water flows and floods posing a major threat to communities along the river. The ultimate goal has been to construct a high-tech sewage system to treat the effluent and return the Emscher and its tributaries to a pristine state, restoring the environment for the benefit of 2.6 million inhabitants and wildlife of the region.

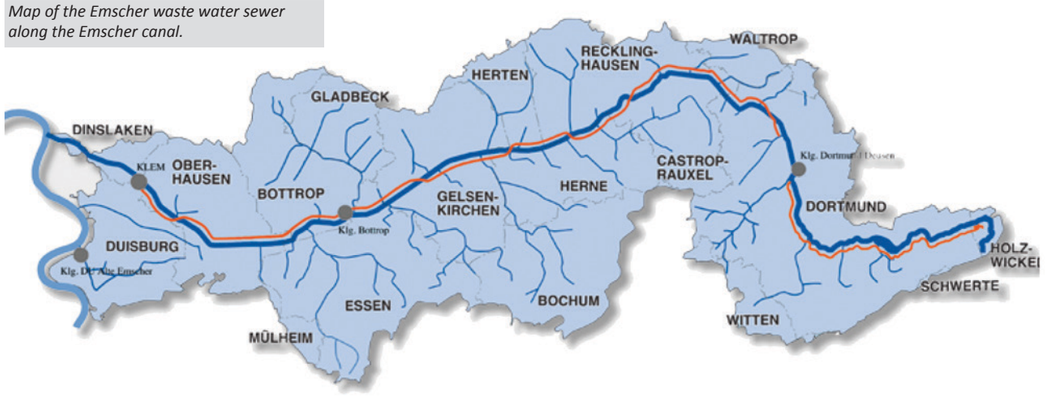
Industrialisation of the Ruhr Area, through which the Emscher flows, began in the 19th century and within decades the commercial and household wastewater fed directly into the river had resulted in widespread contamination and appalling hygienic conditions. The formation of Emschergenossenschaft in 1899 initiated the steps needed to alleviate the problem. However, subsidence prevented the construction of a closed pipeline to carry the wastewater and the river was transformed into an open drain enclosed by concrete embankments. For nearly a century, nothing really changed until the ambitious plan created by Emschergenossenschaft and 19 local municipalities during the 1990's was finally published as the Emscher Future master plan in 2006.

To sum up the Emscher Conversion project in simple terms; this is a massive 51km underground wastewater tunnel connected to a network of underground conduits and pumping stations that will remove all the wastewater currently flowing into and along the open drain. With the demolition of the open sewer systems the Emscher River and its tributaries will revert back to natural water courses.

Dealing with water flow

The main artery of the three metre diameter drainage tunnel starts at the Dortmund-Deusen sewage treatment plant and follows the course of the River Emscher due west to the Emschermündung sewage treatment plant near Dinslaken. At first sight this appears to be quite straightforward, but that is not the case. Along with all the other challenges faced by the project engineers, there was the matter of wastewater flow. To keep the wastewater flowing along the entire 51km, the tunnel must have a downward slope of 1.5m per 1km. This might not seem to be of great significance, but with such an

Map of the Emscher waste water sewer along the Emscher canal.



incline the tunnel would be 75m below ground level when it reaches Dinslaken on the River Rhine.

After due consideration the solution to this problem was to build three large pumping stations at Gelsenkirchen, Bottrop and Oberhausen in order to raise the water from a depth of around 40m to 8m below ground level. This provides sufficient slope for the wastewater to flow off again down the tunnel. These pumping stations are essential to the successful operation of the entire system, which is why such exacting specifications were set out at the start.

As is to be expected for a project of this size and complexity, Emschergenossenschaft required a long term engineering solution that was robust, reliable, efficient, future-proof and capable of meeting all current demands and future expansion. Nothing short of a 100 year working life was necessary, and at no time during this period would there be any halt in the water flow, so all fluid handling equipment had to be fully functional at all times.

Moreover, equipment failure could have devastating effects to the entire system, as flooding would be catastrophic. The pressures, therefore, were on the equipment manufacturers to have complete faith in their technologies. However, even this is not enough. Emschergenossenschaft wanted pumps that would deliver reliability over the long term and economical operation that would deliver energy efficiency. Given that the complete system has a designed lifespan of 100 years, it is impossible to predict with total accuracy the many factors that will affect the performance of the pumping system. Although, reviewing the long-term performance of similar pumps in similar applications does provide a good guide to their suitability.

The pumping system

KSB's principal areas of involvement were the provision of pumps for the Bottrop and Gelsenkirchen pumping stations. Both pumping stations lift the wastewater from the sewer sections at a lower level to the sewer sections at a higher level. The biggest pump sets each have a drive rating of 470 kW and handle up to 6,480 cubic metres of wastewater per hour.

Emschergenossenschaft was ensured that the KSB Sewatec pump systems were up to the task. Already in use in many parts of the world, the pumps are delivering the type of performance and efficiency levels that the Emscher Conversion project required. These highly-efficient, dry-installed pumps are fitted with variable-speed drives, IE3 motors and come with a variety of impeller options. The optimised hydraulic system yields high efficiency, thereby helping to reduce energy consumption and minimise operating costs.

Several modifications were made to the pumps to meet the project's special requirements. A special technical feature of the pumps is their casing design. Unlike Sewatec's standard casing, the casings for this variant were designed with tangential discharge nozzles by KSB engineers to achieve even better efficiencies. The impellers were also optimised to ensure excellent efficiencies without compromising on the high level of operating reliability. In addition, the oil reservoir of the shaft seals and its monitoring device, plus the backstop on the pumps, was adapted to the customer's requirements.

KSB's factory in Halle/Saale produced all of the pump sets for the project, including two huge pumps in close-coupled design specially manufactured for the Gelsenkirchen pumping station. It was here that the efficiencies the pumps achieved on the test bed exceeded the values established through the computational fluid dynamics (CFD) simulation. Each pump was tested individually prior to despatch and showed that the efficiency commitments could be exceeded by up to three percent.

The requirement for the Bottrop pumping station was 10 pumps with discharge nozzles between 500mm and 700mm and impellers up to 900mm in diameter with universal-joint shafts. Nine pumps of the same design were commissioned for the Gelsenkirchen pumping station. In addition, two Sewatec pumps were supplied in the same size in close-coupled design.

Life-cycle costs

For a project of this magnitude, it was important for Emschergenossenschaft to have a good idea of the Life-Cycle Costs (LCC) for the pumping stations and thus, the Total Cost of Ownership. Knowing the LCC enables the customer to have a good idea when the total investment will be paid back. Of the many requirements for this project attaining high levels of pump efficiency and reliability came high on the wish list.

Pump efficiency and pump reliability can be achievable at the same time. In fact they complement each other. To achieve both objectives requires all parties involved in the design and operation of the pumping system to combine their resources and technical expertise to identify the factors that contribute to determining the Best Efficiency Point (BEP). Pumps running at their BEP always achieve efficiency and reliability. This saves on energy costs, components, and delivers a smooth-running system.

No compromise

The Emscher Conversion project is a highly innovative and complex project that has been many years in the planning. Now closing in on its full commissioning date, this closed wastewater discharge system is a state-of-the-art design that harnesses the highest levels of water transportation technologies that are available from world-leading equipment and materials manufacturers. Its owner and operator, Emschergenossenschaft, can now continuously monitor its performance, predict failures, and react to eventualities quickly and efficiently.

The Emscher Conversion project has provided KSB the opportunity to demonstrate its engineering resources and all-round capabilities in designing and delivering an energy efficient and reliable pumping solution that can be seen as a bench-mark for the wastewater handling industry. The bigger the project, the bigger the efficiencies pay-off for the end-user over the long term.

By being flexible in the design, thinking, and capabilities to tailor its products to the customer's requirements KSB has made a major contribution to the Emscher Conversion project. Delivery, installation and commissioning of the 21 Sewatec pumpsets are just the beginning of Emschergenossenschaft's relationship with KSB. A close working relationship will sustain the equipment for many decades through the provision of technical support services, ensuring that its pumps meet the ever-changing demands of Europe's largest wastewater project. ■

Pump failure could have a catastrophic impact to the canal side environment.

After due consideration the solution to this problem was to build three large pumping stations at Gelsenkirchen, Bottrop and Oberhausen in order to raise the water from a depth of around 40m to 8m below ground level. This provides sufficient slope for the wastewater to flow off again down the tunnel.

1

Midlands Meeting and Morgan Motors

Sam Agnew
(AEMT Events
and Membership)

Since joining the AEMT Secretariat in October 2017 as Events and Membership Co-ordinator (Sam Agnew writes), my primary focus has been to speak with our members in order to help me organise a programme of events that are not only interesting but gives AEMT members the opportunity to network and develop their business. The first meeting of 2018 was the perfect opportunity to get to know some of our members and see an association meeting in action.

At a hotel nestled within the Malvern Hills, the meeting began with networking over coffee, followed by a number of talks. The saying goes "you only get out of life what you put in", as with most things this is certainly true with Trade Associations. Responding to feedback from members, Association Secretary Thomas Marks gave a presentation that outlined how members can make the most of the marketing, technical, networking and business resources the Association has to offer.

Following on from Thomas was Dr Martin Killeen, the AEMT's Senior Lecturer. An engaging speaker, Martin has the ability to make even the most complex technical subjects, interesting. He spoke about AEMT training and apprenticeships, a topic that clearly concerned the members in the room judging by the discussion that ensued. In order to help address the sector-wide problem the AEMT are working on a bespoke apprenticeship scheme for its members. Further details will be announced later in the year.

We were also fortunate to have Ian McKay from Kintax explain to members how Research and Development tax credits can be claimed for many projects, details of which can be found in the past events pages of the AEMT website.

Morgan factory visit

The afternoon visit around the Morgan Motor Factory began with a talk from Jon Wells, Head of Design at Morgan. The passion that inspired Henry Frederick Stanley (H.F.S) Morgan to build the first Morgan Car in 1908 had clearly been passed on to Jon, his affection for the company was heartening. Jon recalled how H.F.S Morgan built a mode of transport for personal use to allow him to travel up and down the Malvern Hills with ease. The first vehicle was extremely lightweight, very much like a three-wheeled bicycle with an engine on the front. The construction of this machine defined the philosophy forever, built by hand, built locally, with a high power to weight ratio. Morgan soon went into production, producing the first Morgan car dubbed 'The Runabout'. The cars began to gain some popularity because they were affordable and powerful. Due to their performance people began to race them, and became so successful, that as a handicap they were required to start in the pit lane one lap behind everyone else.

Like most companies Morgan understands the importance of investing in the future, and so towards the end of 2018 Morgan will start production of its first electric vehicle, the 3EV. Morgan's EV has a 120 mile range, taking about 45 minutes to charge, with tops speeds of 100 miles per hour and 0 to 60 in about 7 seconds. Jon remarked "those who have driven a three-wheeler will know that is plenty fast enough!"

Jon describes coach building as Morgan's biggest USP. The term comes from the early days of motoring, when a coach maker of a horse and cart carriage would make a wooden structural frame, and the local blacksmith would make the running gear.

Essentially the body is a non-structural element and doesn't add any rigidity to the Car. Morgan starts by building a rolling-chassis containing all the electronics, driving, running gear, fuel system, suspension and engine. From that point onwards, the wooden frame is hand crafted and placed on top and the aluminium is hand beaten to size and pressed over the top.

A prime example of how Morgan leads the way is with its Aero 8 chassis, which is super-formed with a single panel of aluminium. Essentially the process is like vacuum moulding plastic, the benefits of which are using much thinner material and fewer welding points. It's an aerospace technology which Morgan was the first to use in the automotive industry.

The afternoon concluded with a tour of the workshops dedicated to each part of the construction process. Morgan cars have been built out of the same workshops for almost 100 years, with a production of around 800 cars a year. Each car is custom made for the owner to their individual specification. Unlike years gone by the reputed 11 years waiting list is actually around 4 months now for a fully tailored car.

Unlike the demise of many of the UK sports car greats, MG, Austin Healey, and Jenson; Morgan has only grown in strength. Morgan is as strong today as it ever been, employing around 200 people, turning over roughly £40 Million, and boasting 2017 as the best year yet!■

2

1. Members gather behind a limited edition Plus 8.
2. Anthony Urion of NTN Bearings.

3

4

5

3 Dave Croft of W H Shoebridge and Sons.
4. Morgan's first electric vehicle the EV3.
5. Julian Webb of Webb-Elec Ltd with Steve Ashman of EMIR Software.
6. Julian Webb of Webb-Elec Ltd.
7. Touring around the visitors centre at Morgan.
8. Martyn Waterfield of W H Shoebridge and Sons.
9. Dave Jones of Hereford Rewinds.
10. Hand crafting inside the factory.

6

7

8

9

10

11

12

13

11. Morgan Plus 8 50th Anniversary Car.
12. Jon Wells, Head of Design at Morgan speaking to members.
13. Assembly by hand in the factory.

Custom Electric Drive Solutions Worldwide

Whenever project-related manufacturing and fast delivery is needed

Motors up to 15 MW and 13.8 kV

- Low voltage slip-ring and squirrel cage motors up to 3,000 kW
- Medium voltage slip-ring and squirrel cage motors up to 15,000 kW
- Direct current motors up to 2,000 kW
- Frequency converter-proof drives
- In-house load test facility up to 13.800 V, 2.300 kVA, 120 Hz

Customized special designs

- Custom designs for special applications and operating conditions
- Optimized motor design for higher efficiency
- Mechanically and electrically interchangeable motors
- Commissioning worldwide

More than 20.000 motors available from stock!

24/7 emergency service

MENZEL Great Britain Ltd. | Branch Office UK
20, Trem-Y-Nant | Coed-Y-Glyn | Wrexham LL13 7QL
Tel.: +44-1978-290768

MENZEL Elektromotoren GmbH | German Headquarters
Neues Ufer 19-25 | D–10553 Berlin | Germany
Tel.: +49-30-349922-0 | Fax: +49-30-349922-999

MENZEL ELEKTROMOTOREN

info@menzel-motors.com
www.menzel-motors.com