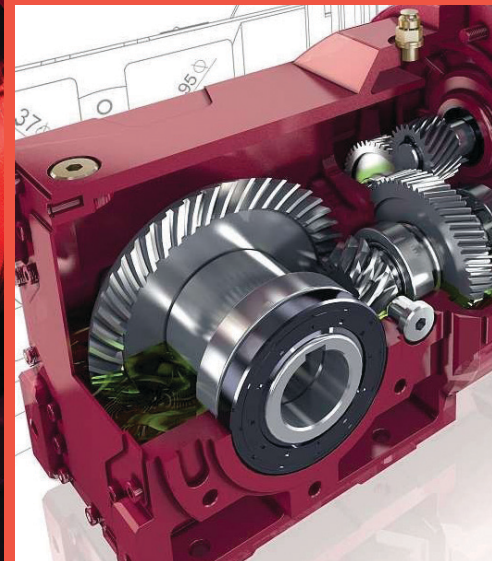


**AEMT**

Volume 19 Issue 1 [www.theaemt.com](http://www.theaemt.com)

# Journal

ASSOCIATION OF ELECTRICAL AND MECHANICAL TRADES



## INSIDE THIS ISSUE...

AEMT News and Member Meetings

IECEX Certification for Personnel and Service Centres

Sulzer Fast Rotor Repair

Flowsolve Looks at Net Positive Suction Head Calculations in Pumps

TEC Motors Expansion

Yilmaz looks at High Efficiency Helical Bevel Gearboxes

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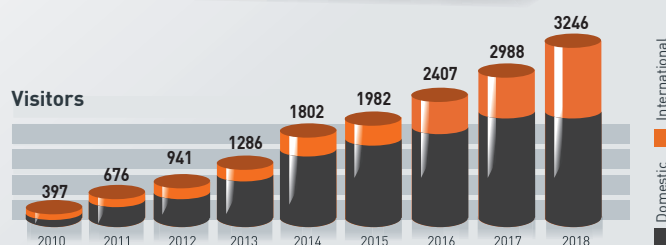
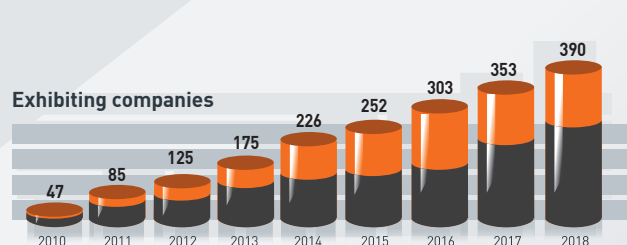




# Coiltech 2019

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- T1 E-mobility
- T2 Advanced powertrains for electric vehicles
- T3 Electric motor industries
- T4 Transformers
- T5 Electric motors for pumps and compressors
- T6 Special electrical machines and actuators
- T7 Testing on high efficiency electric motors
- T8 Electric motors for household appliances
- T9 Materials
- T10 Technologies and systems
- T11 Software

### + Visitor breakdown\*

Head of Production	10%
Production staff	10%
Product and quality management	4%
Head of R&D	7%
R&D staff	8%
Other engineering	2%
Research and University	7%
Owner/Co-owner	18%
President/CEO/Vice president	6%
Other top management	3%
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Purchasing and sourcing staff	6%
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\*Source: Information obtained by the Coiltech Marketing Team on the base of personal phone interviews, encounters, and other research

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Rotating



**Front cover photos:**

Main Image: Sulzer - Dye penetrant testing ensures a new rotor has no flaws.

Top right: TEC Motors painting a selection of motors yellow.

Bottom right: Yilmaz helical bevel gearbox.

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## EDITOR'S COMMENT

**Welcome to the first of the year's Journals. It's been a busy start to the year, and this issue starts off by sharing some of these developments.**

First off, the secretariat is pleased to announce the expansion of its team with a full-time technical support officer to help find answers to member's technical queries, and to help raise the value of AEMT service centres around the world.

The Ex training course is up for an award! The association is a finalist for the contribution to skills and training category of the motion control industry awards.

We continue to promote the industry within trade publications and have shared a couple of opinion pieces written for Drives and Controls and mepca. We look at the importance of making the decision to repair or replace a motor, and at the various influences in industry changing the trade.

Two members meetings have also taken place this year, organised by Sam Agnew. We look at the highlights of these meetings. Our northern area meeting took place at Labman Automation, a unique company with a unique business approach. The southern area meeting took place at Hayward Tyler's centre of excellence in Luton, and proved to be a fascinating visit.

Sulzer share how a fast rotor repair also improved efficiencies of a machine, as well as looking at improvements to their high voltage coil manufacturing division.

3 years after visiting TEC motors, we go back to see how much the company has changed in just 36 months. Having outgrown their previous shell, they have recently moved into a purpose built 100,000 square foot facility, increasing their stock levels to over £12 million.

New member's to the AEMT, Yilmaz explains how helical bevel gearboxes can improve on the efficiencies of a traditional worm gearbox, and lower costs.

And to promote our increasing collaboration with the British pump manufacturer's association, we share an article recently published in their new flow magazine, which takes a look at understanding and calculating net positive suction head in pump systems.

**Thomas Marks,**  
*Editor.*



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# 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 we move through another Spring, I am nearing the end of my two years as AEMT president, with Dave Hawley of ABB, to takeover the role of President at the AEMT AGM in June.



**I have thoroughly enjoyed my time as President and have been well supported in the role by my fellow council members and of course, the secretariat.**

My particular thanks go to Thomas and Sam at the AEMT, for their help and guidance on all AEMT Events and Shaun Sutton for taking on the very important role of Treasurer. Graham Brooker, as Past President has also been a constant sounding board in many key decisions that have had to be made during the last two years.

During this period, we have seen some really encouraging changes to the AEMT, with the rise of the fantastic AEMT Awards, the relaunch of the AEMT Conference, and a personal passion of mine, the reprisal of the AEMT Golf Day!

All of these events have helped to create fantastic networking opportunities, have been very well attended, and have provided the chance to learn from each other and share experiences and I do hope to see you at one or all of the events later in the year!

The next potential area of benefit to the members, that we need to move forward, is the advance of more diverse training courses and importantly the

chance to learn online, making it much easier to learn the basics from wherever you are located. This will certainly help with Apprenticeship training and Apprenticeships is another key area for members that the AEMT will continue to try and help.

As with any trade association though, we need you as members to continue to contribute with your ideas, attend events and inform us of how the AEMT can help your business.

The council and the secretariat are only too happy to be guided into new areas, especially if such suggestions will help you to run your business more effectively, so please send us your ideas and give us your time!

The AEMT is and needs to continue to be a strong representative for the electro-mechanical industry, helping to set and guide repair and other international standards, educate its members and provide the services that the industry requires.

I know Dave Hawley is very keen to pursue new avenues and continue to drive the AEMT forward. For my part, I will become Past President and will continue to contribute where I can to the

AEMT's continued success, so I won't be slipping away completely just yet.

Thanks to all members for your continued support and here's wishing we have a great summer and I hope to meet you at an upcoming AEMT event soon.

**Gary Downes**  
*AEMT Honorary President*



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AEMT Members at the Morgan Motors Factory Tour in 2018.

# New Members in 2019

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# AEMT nominated as finalists for Contribution to Skills and Training

We are proud to announce that the AEMT has been nominated as finalists for the Contribution to Skills and Training category for the Motion Control Industry (MCI) Awards for the repair, overhaul and reclamation of hazardous area (Ex) equipment, which are to take place on May 22nd 2019 at the National Conference Centre, Solihul.

The association has a respected and well reputed training course aimed at training service centre personnel in the requirements for the repair of equipment designed for operation in explosive atmospheres. Should such equipment create an ignition point for the surrounding flammable gas or dust, then the consequences can be devastating. Lives can be lost, buildings destroyed, companies destroyed through expensive legal battles, and eco-systems can be badly damaged or ruined. The course is held in many locations all around the globe including England, Middle East, and South East Asia.

The course looks in particular at clearly explaining the requirements of the international Ex repair standard, 60079-19. After the training, delegates are assessed on their ability to understand:

- Explosion Protection, theory, concepts and design features
- Reading and interpreting Ex machine labels.
- Paperwork and documentation requirements
- How to handle and test the machine before and after repair, overhaul or reclamation.
- How to take accurate measurements, required before repairing the machine.
- How to complete repair sheets for the various different designs of equipment.

Alongside the intensive 4-day course, delegates receive a comprehensive course note book, a reference book for interpreting labels, and access to the association's latest repair sheets. Delegates also get hands on experience with the various different types of equipment they can expect to repair, so they can touch, feel, and see the differences in design to a normal



machine, as well as practise taking the measurements required to repair the equipment. Delegates also receive ongoing support after the course, helping them to become competent.

The first "Code of Practice for the Repair and Overhaul of Ex Electrical Apparatus" was written jointly between the AEMT and BEAMA. The document had input from major users of Hazardous Area Ex Equipment, and the Health and Safety Executive (HSE). It was subsequently adopted as the International Standard IEC 60079-19, which is now used as the basis to audit companies to IECEx Certified Service Facilities.

The association sits on the steering groups and committees which drives the continued improvement of these standards. Our lead lecturer, Dr. Martin Killeen has passed both Units IECEx

001 and IECEx 005, which proves his competency in the fields for which he teaches. The course is also one of a few courses in the world to be officially recognised by the IEC as a competent provider of training in the field. To date we have trained over 86% of all service centres in the UK, Middle East and South.

Thomas Marks, Secretary to the association adds, "To be nominated as a finalist at the MCI Awards is a testament to all the hard work that has gone into developing this important course. To be recognised for this award and be by the IEC within the same year demonstrates how the course has matured to become the leading training course for anyone preparing to handle Ex equipment in their service centres. We can now confidently say that it is now the best course available for anyone looking to train their staff." ■

***To be nominated as a finalist at the MCI Awards is a testament to all the hard work that has gone into developing this important course.***



## Karl Metcalfe joins AEMT as technical support.

New recruit Mr. Karl Metcalfe joins the Association of Electrical and Mechanical Trades (AEMT) to offer technical support to its members and help develop the quality of AEMT service centres around the world.

Coming from IECEx Certified Service Centre, Kirkby Lindsey in Hull, UK, Karl has worked within the rewind industry since 1987 developing a broad and deep knowledge of the sector. He joins the team full-time and has been tasked with finding the answers to members questions, whether they be standard engineering practise, or explosion proof (Ex). He will also be supporting the Ex repair courses and helping develop awareness and integration of the new repair standards BS EN & IEC 60034-23 for the repair, overhaul and reclamation of rotating electrical machines.

Starting his apprenticeship at York based service centre Eclipse Engineering, Karl trained as a time served electrical rewinder and fitter, where he worked extensively with low voltage machines, pumps and gearboxes.

In 2011, he left Eclipse to move into sales at Featherston, where he gained experience in handling medium to high voltage equipment. He later became works manager of Kirkby Lindsey in 2015 where he was also the responsible person for signing off all Ex equipment.

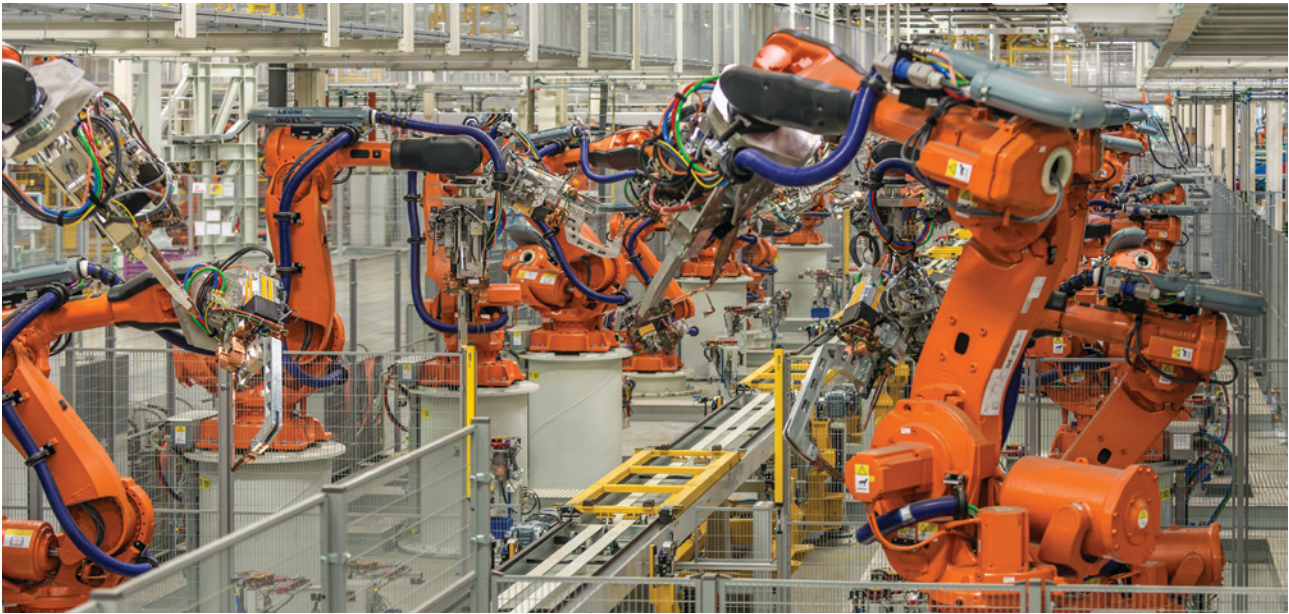
***To join the AEMT as technical support is a natural progression in my career. I am at my happiest when solving a problem for someone.***

Karl reflects, "I spent 32 valuable years gaining vital experience and knowledge by rewinding and fitting electric motors and ancillary equipment. Throughout my entire working life my aim has been to improve, learn, and understand the customer's needs."

"In my time as an engineer, the AEMT has always been a huge support. The meetings and training courses have enabled me to meet fellow engineers and fill the gaps in my knowledge. The technical publications and enduring yellow yearbook living on the shelves of the workshop have been a go to reference. To join the AEMT as technical support is a natural progression in my career. I am at my happiest when solving a problem for someone. All the experience and knowledge I have built up, can now be expanded upon limitlessly as I delve into the queries sent to me by fellow engineers. I very much look forward to meeting members and associates over time and helping to promote and support the excellent engineering work they carry out."

Thomas Marks, secretary to the association adds, "Karl has already made it his business to help out our members from day one. Flying through his Ex refresher course in Loughborough means he is fully up to date with Ex best practise. Our focus is to ensure that AEMT service centres can be looked upon to maintain and improve rotating electrical machinery efficiencies and to help ensure industries have a trusted choice when it comes to managing their plant's assets."

Karl is working from the office full-time, to contact him for a technical problem, or to say hello and introduce yourself he can be contacted by emailing [technical@aemt.co.uk](mailto:technical@aemt.co.uk) or by calling +44 (0) 1904 674 897. ■



# The role of rotating equipment repairers is changing

*(excerpt from Drives and Controls March issue)*

All those involved in the repair of rotating equipment have seen considerable change in the industrial landscape over recent years. Operators have become more demanding and machinery has become more complex. All the while, maintenance and repairs need to be completed to ensure continued reliability and performance, and our members approach this challenge from both sides. Thomas Marks, Secretary to the AEMT, looks at the changing role of rotating equipment repairers.



**Thomas Marks**  
(AEMT Secretary)

***The task of repairing rotating equipment has certainly evolved in recent years. As with any industry, we have taken on board new technology and adapted it to make improvements to our way of working. Lean manufacturing processes have improved efficiency and enabled us to reduce lead times for repairs.***

In addition, there has also been much more of a focus on prevention, using proactive maintenance to minimise downtime. Data collection and analysis has become much simpler, enabling machine operators to look at long term trends in machine performance and make better judgements in terms of planned maintenance.

Minimising downtime has always been important, but the need to

extract the best performance from the minimum of resources has reached new heights. Operators are less able to have redundant machinery that can be used while duty equipment is offline or being repaired. Fixed assets need to be operational 24/7, with the only downtime being for planned maintenance.

For this reason, repairers have had to become more responsive in the event of a machine failure. No matter how old it is, customers expect new parts to be manufactured almost overnight. The latest technology is both a blessing and a curse – it enables repairers to create identical new parts quickly, even improve the design for better performance. However, the end users are equally aware of these new abilities and

therefore expect a much faster service. At the same time, there is also a focus on the circular economy, reducing energy inputs, minimising the use of raw materials and increasing the amount of recycling. This has recently been formalised in the international standard IEC 60034-23:2019, which sets out the need to reduce material consumption and improve energy efficiency.

Ultimately, the role of repairers has become more demanding and more complex. New technology has delivered greater insight and the ability to repair machinery much quicker. However, at the same time, there is an expectation to improve performance, efficiency and reliability almost overnight; a goal to which we all aspire. ■



# Motors: Repair or Replace?

(Except from mepca magazine, April.)



**Thomas Marks**  
(AEMT Secretary)

To repair or to replace an electric motor is a decision that often crops up in industrial settings and is one that should be given due consideration. Of course, minimising downtime is important, but there are other important factors as well. Thomas Marks, Secretary at AEMT, looks at what considerations should be made when it comes to repairing or replacing electric motors.

Decisions about repairs to any equipment usually revolve around two variables, time and cost; critical process machinery needs to be repaired quickly and the cost is offset by the loss of production. Speed is of the essence and in such cases, spare parts are usually held in stock, making replacement the obvious choice.

However, this opens up the opportunity to also have the failed component repaired without affecting the production schedule and providing a new spare component for future use. From this

point, any process where repair time is slightly less critical, the option of rewinding the electric motor becomes a distinct advantage.

## Opportunities for improvement

Assuming the design of the motor continues to meet the needs of the application, the severity of damage to the motor needs to be carefully assessed to determine the cost of repair. Damage to the stator core, the rotor or other mechanical parts will have a significant bearing on the final cost.

Most electric motors deliver a considerable period of service and during this time the application may have changed, and the technology used to build the motor will certainly have moved on. A breakdown offers the chance to assess the suitability of the motor design to the current application and make any changes that could improve reliability and efficiency.

One of the major advances is in insulation technology, which has enabled thinner layers to offer improved performance and efficiency, compared



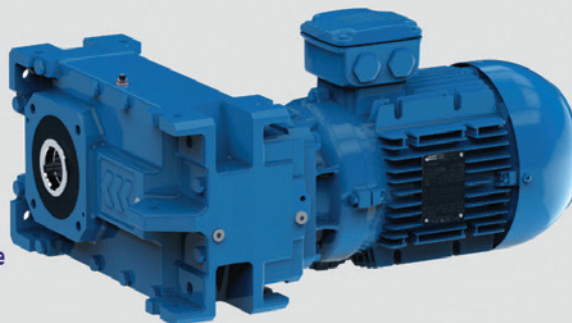
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to materials being used two or three decades ago. Reduced insulation thickness allows for additional copper to be used in the windings, which can increase output.

### Minimising resources

This leads onto the next point, which is considering the amount of resources being used to return the application to normal operation. Replacing bearings, which resolves around 50% of motor failures, will double the life of the motor and use 99% of the original materials because the bearings are regarded as high-quality, green scrap.

By reusing, repairing, refurbishing and recycling existing materials and products, businesses can improve their environmental credentials. By encouraging a circular economy, businesses are taking responsibility for their decisions and actively reducing the amount of resources that they consume.

### Improving efficiency

The breakdown of an electric motor

***By following good practice repair methods, those responsible for repairing electric motors can offer an invaluable service while at the same time reducing the amount of resources that are being used.***

never happens at a convenient time, but the situation can be turned into an opportunity to implement improvements at the same time as returning the application to normal operation. Since around 95% of the running costs associated with an electric motor are energy costs, the efficiency rating of the equipment should be carefully considered.

A new motor should offer an improved efficiency rating and therefore reduced annual costs, but a rewind motor can also offer several benefits. Having been rewound by hand, it is not subject to the errors of mass production and the windings will have been precision-

made to give a perfect fit in the stator. Furthermore, research by the AEMT and EASA has shown that motors can be rewound several times while maintaining, or even improving, electrical efficiency.

Ultimately, motor reliability is the main goal as this will minimise downtime and the costs that are associated with it. By following good practice repair methods, those responsible for repairing electric motors can offer an invaluable service while at the same time reducing the amount of resources that are being used. ■



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#### MOTOR GEARBOXES

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(low power motor gearboxes)

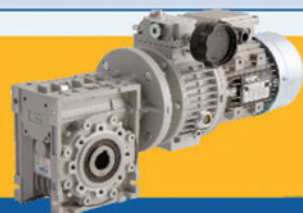
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Dye penetrant testing was completed to ensure the new rotor had no flaws

## Improved Efficiency after fast rotor repair

When a cracked steam turbine rotor came into the Indonesian Sulzer work shop for repair, the team managed to repair and reinstall the equipment with a markable improvement on performance within a matter of weeks.

The damaged rotor came from a power generation plant in Indonesia. Rather than wait for at least a year for a new rotor from the original equipment manufacturer (OEM), the plant opted for a repair that took only sixteen weeks. This swift and effective repair also managed to achieve an 8% improvement in efficiency.

The Indonesian geothermal power plant had been experiencing some issues with one of its 60 MW steam turbines. Despite several attempts to low speed balance the rotor at their premises, it still exhibited high vibration levels, and some deep cracks were discovered. After several repair attempts on the turbine, the vibration issue had persisted. At this

point Sulzer was called in to advise on a solution to their problems.

### Initial investigation

Sulzer's initial inspection revealed that the rotor had cracks on the radius section between the last stage disk and the gland seal area located on both the governor





The stub shaft was shrink-fitted to the shaft before being welded in place.

and the generator sides. In addition, there was considerable evidence of erosion on the blades, the disks and the balance correction holes.

### Repair re-evaluation

The initial plan was to machine out the material until the cracks were removed

and then rebuild the shaft using submerged arc welding before machining it to nominal dimensions. However, after a comprehensive inspection at the Sulzer workshop, the crack propagation already had a spiral shape through the centre of the shaft, making it impossible to machine out the crack area only. So, a repair proposal was developed that

***There was always a customer representative in the workshop, which helped maintain excellent communications and keep them up to date with progress. Any rotor repair is time-critical, with lost revenue making every day count in this project.***

involved designing a stub shaft that would be used to join the two pieces together before the shaft was rebuilt to its nominal dimensions.

Andrianto Hapsoro, Head of Engineering, Sulzer Indonesia, explains: "There was always a customer representative in the workshop, which helped maintain excellent communications and keep them up to date with progress. Any rotor repair is time-critical, with lost revenue making every day count in this project."

With the location of the repair being so close to the 6th disk, some additional repairs would be needed to this disk,





which would extend the overall time to complete the project. In order to save time, Sulzer proposed both stage 6 disks would be removed and possibly reinstated at a later date. This was then agreed by customer.

## Repair expertise

Joining two sections of a turbine rotor requires considerable expertise, including computer modelling and finite element analysis (FEA) to ensure that the proposed design would withstand the stresses of normal operation. The FEA was also carried out at an overspeed of 3'600 rpm to ensure that the centrifugal



*Precision machining was required to ensure a perfect fit.*

loading on the disks would not cause any damage to the rotor shaft after the repair. With all the necessary analyses completed, the machine shop started to prepare the two rotor shaft sections for the addition of the stub shaft.

In-house precision machining enabled the stub shaft to be shrink-fitted into the prepared connections before the whole joint area was preheated prior to the welding process. Using precision-controlled, submerged arc welding equipment, the stub shaft was built up to a level that would allow it to be machined back to the required dimensions. Once the original dimensions had been achieved, a series of non-destructive tests (NDT) was carried out to ensure there were no flaws in the completed rotor assembly.

These processes were repeated to remove the cracks in the thrust end of the rotor as well, bringing the completed assembly back to finished dimensions. Once all the machining was complete, the rotor was dynamically balanced before being shipped back to the customer.

## Improving performance

While the repairs were being completed on the rotor, the field service team

was working at the customer's site to repair the diaphragm and improve the sealing of the casing. This work would be influential in improving the efficiency of the steam turbine.

Prior to the project being started by Sulzer, the turbine required 393 tonnes of steam per hour to produce the 53.4 MW of energy. Despite one set of disks being removed, Sulzer's repair to the static and rotor components of the turbine enabled it to maintain an output of 55.1 MW but using only 374 tonnes per hour of steam, which is an 8% improvement in efficiency.

When the repaired turbine rotor arrived back on site, the field service team carried out the installation and commissioning, which included vibration testing at full load. All the results were well within the original specifications and the generator has remained at full capacity ever since.

Andrianto concludes: "The customer was very impressed with the results of this project. In total, the whole repair took only 16 weeks, which is considerably less than the estimated lead time for a new rotor from the OEM, which is closer to 52 weeks." ■





The increased capacity of the test bed area allows larger motors to be tested.

# Sulzer investments further improve speed and quality of high voltage coil manufacturing

Reducing the time to complete a repair or refurbishment of high voltage equipment minimizes downtime and increases productivity. Sulzer is continuing to invest in its design, manufacturing and testing facilities to enable faster turnarounds for customers. To keep up with growing demand, Sulzer is also increasing the capacity of its Falkirk Service Centre, where the test-bed load capacity has been doubled.

Until now, the Falkirk site has used a 1'250 kVA diesel generator that operates through two step-up transformers to provide 3.3 - 11 kV via high voltage switchgear to the test cell. This setup ensures a reliable power source for testing that is not affected by local demand on the power grid.

The new investment by Sulzer will add a 2'000 kVA and a 700 kVA generator to

the site that will be synchronized through a 4'000 amp low voltage switchboard, as well as a new 2'500 kVA transformer, that will double the capacity of the test bed.

## 2 MW load testing

The original capacity of the service centre was 1'000 kW in load testing, of which 800 kW could 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. The installation of the new equipment will increase the load testing capacity to 2'000 kW for horizontally-orientated motors as well as an increase in voltage to 13.8 kV. The majority of the equipment tested in the additional 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 will still remain.



Furthermore, an additional test-bed area is now in place to allow multiple motors to be tested alongside each other. This means that if the testing of one motor needs to be extended, it will not hold up other projects, allowing equipment to be returned to customers on time.

The new test bed offers customers 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 that have undergone major repairs can be tested to ensure that they are fit for purpose before they are re-installed and recommissioned.

### Improved customer experience

As part of this upgrade project, the test area is equipped with the latest monitoring controls and safety equipment that provide the test engineers with remote visualizations of the sensor readings while protecting them from large pieces of rotating equipment. A customer viewing area is also available, from where owners of equipment can watch and interact



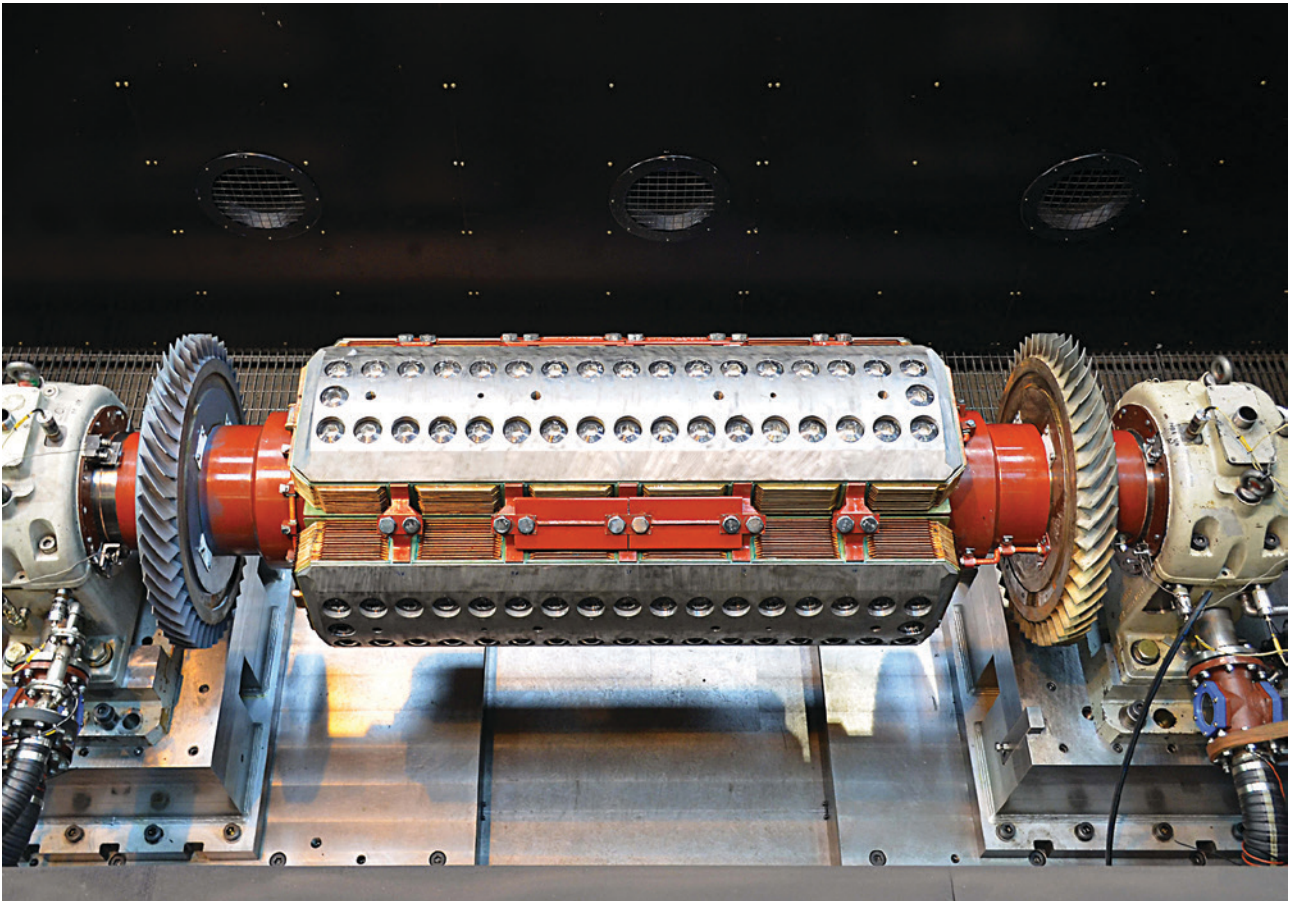
The new coil test lab enables both thermal cycling and voltage endurance testing to be completed in-house.

**The new test bed offers customers the possibility of load testing generators using a slave motor to turn the generator and connecting the output to a load bank.**



The new control center provides remote visualizations of performance data for both test engineers and customers.





Sulzer's balancing pit is one of the only independent facilities in the UK.

***Now, more and more customers are requesting full-load testing following an overhaul, giving them complete peace of mind that the equipment is fit for purpose.***

with the test engineers to ensure that the entire process is transparent and straightforward.

Marc Stuart, Service Centre Manager, at Sulzer's Falkirk site comments: "In the past, only equipment that had undergone a major repair would have received a full-load performance test. Now, more and more customers are requesting full-load testing following an overhaul, giving them complete peace of mind that the equipment is fit for purpose.

"Our customers are now able to see their motor operating at load and can review a complete set of test results, including vibration analysis, partial discharge, motor current signal analysis (MCSA) and

other condition monitoring data. This is providing our customers with confidence, not only in the performance of the motor but in the service solutions they are receiving. A full test report can then be issued, providing a baseline set of data that they can use once their equipment is installed and running in its application."

### Investment in cutting-edge facilities

Sulzer's investment program in the UK has delivered a range of new equipment and machinery including replacement looping machines, shaping machines and a state-of-the-art robotic taping machine that will together provide enhanced precision, quality and speed in the manufacture of HV coils.

A major investment has also been made in the design and testing capabilities at Sulzer, with the creation of a 'Coil Test Lab' that will enable voltage endurance and thermal cycling tests to be carried out in-house. These tests can determine the durability and expected lifetime of HV coils and ultimately provide a quality rating for the insulation system.

The final step in the repair process for high voltage machines is balancing the rotors to ensure smooth and reliable operation, especially during start-up and shutdown procedures. Sulzer has one of the only independent high-speed balancing facilities in the UK and it has recently been updated with the installation of CABFLEX3 software and additional hardware that will significantly reduce the time required to balance a flexible rotor.

Sulzer continues to invest in its facilities across the country to improve the speed of service to its customers and to ensure the highest quality repairs are delivered. To see the video showing details of the Falkirk facilities, visit: <https://youtu.be/CfnvgiJm1T8> ■



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Completing an Ex repair sheet.

# IECEX Competency at hazardous area (Ex) equipment repair.

This article outlines the steps to go through in order to acquire an IECEX Certificate of Personal Competency (CoPC) for unit Ex 005, the repair overhaul and reclamation of hazardous area equipment.

## Training

You must already be a competent repairer for rotating electrical and/or mechanical equipment. The next step to personal competency is to be trained by an IECEX recognised training provider (RTP) for Ex005 and to understand the requirements of the latest international repair standard IEC 60079:19 Explosive Atmospheres: Repair, Overhaul, and Reclamation.

The AEMT is a leading provider of this training with a trained lead lecturer, who has also gained IECEX CoPC in units Ex 001 (Basic knowledge and awareness to enter a site that includes a classified hazardous area) and Ex 005 (Overhaul and repair of explosion-protected equipment). After completing Modules 1 and 2 of our repair course, and passing the AEMT Assessments for theory and hands-on, we will issue a Certificate of Assessment. This certificate means the course assessments have been passed, but does not necessarily mean the

individual is competent, until he has gained further experience.

## Competence

Competence is built up with regular hands-on experience of repairing Ex equipment after attending the courses. An engineer repairing a lot of equipment

every day after the course, could be classified as competent after a period of 6 months, someone seeing fewer motors may take 2 to three years before they could be classified as competent. A work log should be kept as evidence, and signed off by a supervisor or manager. An AEMT work log can be



Having a library of standards is essential, the flameproof design standard and the repair standard are commonly referred to

obtained from the AEMT. In general most delegates passing their refresher course assessment after three years and having accumulated hands-on experience in their service centres, could apply to an IECEx Assessment Body to take the IECEx Ex 005 assessment.

The work log should include:

1. Date log
2. Job number
3. Equipment Make/model
4. Equipment Power rating
5. Protection concept(s)
6. Standard(s) or Drawing(s) used for the repair.

After initial training, a refresher must be taken every three years in order to

stay current with updates to standards and working practices, and also to be re-assessed.

Module 3 (or 2R international) of the AEMT Ex Training course are designed for those requiring a 3-year refresher.

### Assessment by Certification Body

When experience and relevant training has been accomplished, the person should be ready to sit the Ex Certification Body's (Ex CB) examination (note that ExCBs do not offer training, this can only be provided by independent bodies such as the AEMT). Please refer to the IEC Operational Document IECEx OD 504 available on the website [www.iecex.com](http://www.iecex.com).

com for the full criteria of what will be assessed by the Ex CB.

A list of local ExCBs can also be found on the IECEx Website. In the UK we recommend SGS Baseefa, whose contact details can be found below.

Tel: 01298 766 619

SGS Websites: [www.sgs.com](http://www.sgs.com)

On successful completion of the exams, the candidate's work log and CV (including a list of relevant skills & training, years of experience, and quality systems used) shall form part of the final application to the ExCB to attain their IECEx CoPC. ■

# IECEx Certified Service Facility Requirements

This article outlines the steps to go through to get a workshop up to the required standard to repair ATEX and other Hazardous Area equipment and apply to be audited to become an IECEx Certified Service Centre if required. The broad outline is followed by AEMT Ex Register of companies who are members of the AEMT and have used the association's courses to learn how to handle Hazardous Area equipment. As well as these the association has trained other international oil and chemical companies and equipment manufacturers.

## Training

The first step to being able to service and repair Ex equipment to IECEx standards is to be trained to repair the equipment using the latest BS EN and IEC 60079:19 Repair Standard for Explosive Atmospheres: Equipment repair, overhaul, and reclamation (currently in iteration 2011 + A1:2015). This was originally developed from the AEMT BEAMA Code of Practice on Hazardous Area equipment repair. The standard has now been broadened to include the repair of all electrical equipment including some instrumentation, and mechanical equipment, which is included in the ATEX Directives.

The people requiring ex training are most importantly the manager(s) or supervisor(s) responsible for overseeing

the repair of hazardous area equipment.

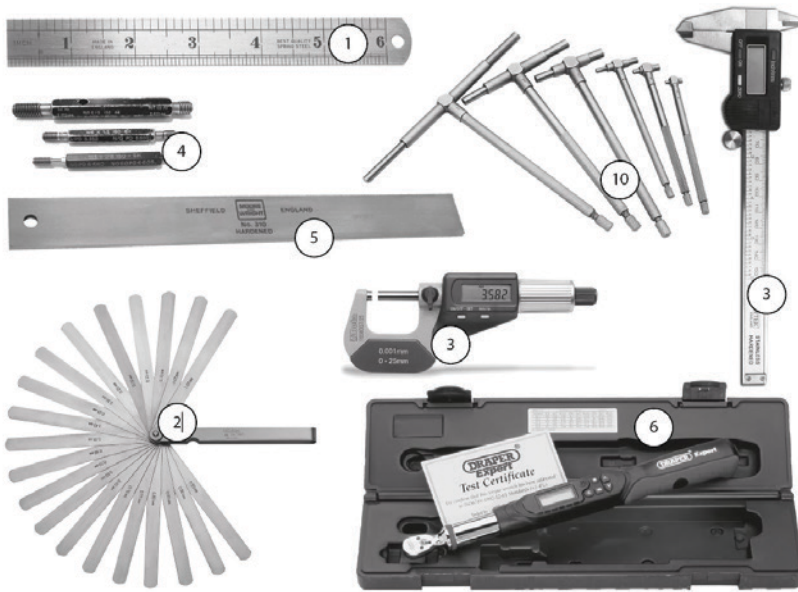
These would be delegated as the "responsible person(s)" and able to oversee repairs and give full support to the "operatives" carrying out any overhaul or repairs. They can also verify that the equipment has undergone a detailed inspection during repair, to ensure that it conforms to the original certificate and standards after repair. This declaration is also signed by the operative responsible for the repair and verified by a responsible person.

"Operatives" (as they are referred to in the standard) are those people repairing hazardous area equipment. They should also attend the Module 1 theory and Module 2 hands on courses.

AEMT Certificates are issued to those passing the course assessments. Proof of successful training, knowledge, and at least 3 years experience is necessary to prove competence.

Very comprehensive Course notes are provided on the course explaining in detail the latest BS EN IEC 60079-19:2011 + A1:2015 standard requirements. The AEMT is actively represented on the IEC and IECEx standards committees. The course notes are continuously updated to include any changes in the standards or Ex repair system requirements. They also now include details on pump repair, and ATEX mechanical concepts for fans and gearboxes etc.





1. Engineer's Rule: inch and metric.
2. Feeler Gauges: inch and metric.
3. Calibrated Digital or Analogue Vernier Callipers/Micrometres: Strongly recommended for measuring metal thickness, outside and inside diameters. Appropriate to the frame sizes being repaired. Micrometres both internal and external can be used and are more accurate for measuring small flamepath dimensions.
4. Calibrated Screw Thread Gauges: Go and no-go, as appropriate.
5. Calibrated Engineering straight edge: Used to inspect that surfaces are flat.
6. Calibrated Torque wrench Kit.
10. Telescopic Gauges ideal for the measurement of internal diameters.

## Quality System

It will help a great deal if your company has a quality control system such as ISO9001:2008/2015, which many already have. This will need some modifications as stated on the IECEx website at [http://www.iecex.com/service\\_facilities.htm](http://www.iecex.com/service_facilities.htm) with regard to repairing equipment to the above standard. The quality system also requires that your equipment is properly identified and calibrated. Quality System Requirements for IECEx Repair Workshops should also comply with OD314-5. Some auditors are now moving on to ISO/IEC 80079 34: 2011 standard: Explosive atmospheres: Application of quality systems for equipment manufacture.

## Equipment

Tools and equipment must be suitable for the sizes of motors seen for service and repair. A library of certificates and Ex standards will be required to cover the protection concepts of the machines being repaired, so that it can be brought back to the standards it was originally manufactured to (covered in detail during the course).

## Repair practice and systems

Having attended the course, the company is able to put in the required systems, and paperwork in place to record Hazardous Area equipment repair.

This builds up a history of using the AEMT repair forms for each protection concept, what standards have been used to repair machines, and measurements taken before and after repair to meet

the standards. These records are kept for a minimum of 10 years. Areas of the workshop will need to be identified for conforming and non-conforming equipment. This forms the basis of the repair system, together with the guidance documents downloaded from the IECEx website. In particular those operational documents ("OD's") ending in "5" and IECEx 3-5.

## Audit, Assessment, AND Certification

Once a good record of repairs has been built up to the above standard, the company can apply to a Certification Body to be audited. This will require a comprehensive manual on how your facility has incorporated the 60079-19 standard into your workshop procedures. Relevant IECEx operational documents, which can be downloaded from the IECEx Website: <http://www.iecex.com/operational.htm>

There are a number of operational documents available from the IECEx Web site, however these will be much better understood once the manager/supervisors of the workshop have attended the training courses.

Other standards to be used in conjunction with the above include:

- BS EN and IEC 60034-23:2019 repair overhaul and reclamation of rotating electrical equipment.
- BS EN and IEC 60079 19 A1 +2015 Explosive Atmospheres: Equipment repair, overhaul and reclamation.

- ISO 9001: 2015 Quality Management System – Requirements.
- ISO/IEC 80079 34: 2011 : Explosive atmospheres: Application of quality systems for equipment manufacture.
- Other IECEx documents available from the IECEx website IECEx 03-5, IECEx OD313-5, OD314-5, and OD315-5, OD316-5, all available from the IECEx website as above.

Once it is in a position for a preliminary audit, the audit and certification will be carried out by a local certification body. In the UK the certification body the AEMT works closely with is SGS (details below). For other locations, please consult the following list of IEC Ex Certification Bodies (IECEx CB): <https://www.iecex.com/information/excbs/service-facilities/>

Tel: 01298 766 619  
SGS Websites: [www.sgs.com](http://www.sgs.com)

SGS is a certification body and a member of the AEMT. They have carried out many workshop audits. As per ISO 17025 the audit company should not be involved in the training of the facility that they are auditing.

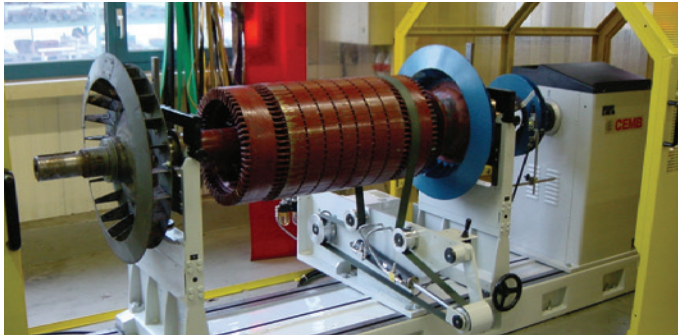
The procedure to obtain a successful audit may take up to a year to complete once the company has completed any training required. It needs to build up a good history of repairs and procedures for the auditor to check, and overcome any non-compliances. It is similar to an ISO 9001 audit (although some companies have achieved success in around 6 months). ■



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# Make NPSH add up to reduce cavitation

To help readers understand what NPSH is and how to calculate it, flow (BPMA's new magazine) spoke to Shaun Hampson, Managing Director, Flowserve's Manchester Quick Response Centre.

**Cavitation can cause significant damage to centrifugal pumps and their components, resulting in costly repairs and unplanned downtime. However, understanding NPSH and using its calculation as part of the pump specification process can significantly reduce the effects of cavitation.**

**flow: What is the meaning of NPSH and how important is it to a centrifugal pump application?**

**Shaun Hampson:** A commonly used acronym within the pump industry, NPSH stands for Net Positive Suction Head. It is a consideration in centrifugal pump selection because it represents the adequacy of liquid feed relative to the need of a pump.

Starving the suction of a pump with poorly available NPSH can rapidly cause cavitation damage. NPSH is relatively simple to calculate, but some factors, such as where liquids approach their boiling point (vapour pressure), or applications where there are long torturous suction pipe-lines, can make it more challenging to accurately assess.

There are several areas which need to be considered when calculating NPSH. The first is cavitation, a very aggressive form of damage. The second is pressure head which is measured in metres, as opposed to conventional pressure measurements in bar, psi, Pascals, etc. The properties of the liquid being pumped also affect the NPSH calculation – where a special focus is needed when pumping LPG and liquids near to their boiling point, for example.

## Cavitation

In broad terms, cavitation starts with the partial evaporation of the liquid because it is being sucked hard, in a non-linear, and turbulent environment. As its vapour pressure is compromised, it starts to

evaporate into entrained pockets of vapour.

These tiny pockets of vapour enter the pump impeller in their thousands, but are condensed as the surrounding fluid is internally pressurised toward the discharge.

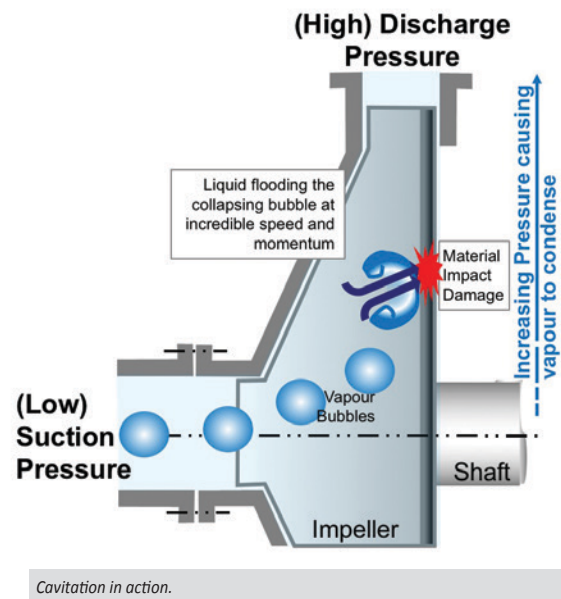
Bubbles collapsing in the vicinity of the impeller ignite damage, as surrounding liquid rapidly fills each of these little voids. The impeller material acts as the backstop to liquid entering these cavities at supersonic speeds and the result is impact erosion known as cavitation damage, which can quickly destroy even hard material pumps. Consequently, it is vital to protect against cavitation by ensuring that there is adequate NPSH available from within the pumping system.

A specifier needs to distinguish between the NPSH required for the pump and the NPSH available from the application. NPSH required by the pump is commonly known as NPSH(r) and this information is provided by the pump manufacturer. NPSH available is termed NPSH(a) and needs to be calculated from the system characteristics.

To minimise cavitation there should be more NPSH(a) than NPSH(r) plus a reasonable safety margin in which to account for entrained liquid impurities which may distort its vapour pressure.

## Pressure head

Pressure head is used in the calculation of NPSH because conventional pressure is influenced by liquid density. As centrifugal pumps handle liquids of all types and with



varying densities traditionally measured pressures vary.

So, rather than a manufacturer creating thousands of pump selection curves for an infinite variety of density options, it is standard practise to employ 'head', a column of liquid expressed in metres and which doesn't change. Head is the height of liquid which will be generated above the pump centre when an impeller of a given diameter is spinning at a given speed. While this remains constant, a conventional pressure measurement taken at the pump discharge will vary with different liquid densities.

**f: How is NPSH calculated in a typical application?**

**SH:** The key to understanding NPSH lies in the first term, 'Net'. This represents the total positive suction head once all pluses and minuses have been netted off.

There are four suction pressure variables needed to calculate NPSH(a). Two are always negative, they simply need to be added together and are easy to remember:

1. *Static height of liquid.* This is either

- above or below the pump (with suction lift pumps for example) and can be either a positive or negative figure.
- 2. *Vapour pressure of the liquid.* This must be removed and is therefore always negative.
- 3. *Pipework and valve losses.* This is measured upstream of the pump, back to the liquid source, and is always negative.
- 4. *Atmospheric pressure head.* This is the pressure acting on the liquid surface. While this pressure is in its absolute form, it is always positive, regardless of any possible suction vessel vacuum applications.

When calculating NPSH all units need to be consistent. This means converting the atmospheric pressure head (p) and vapour pressure (Vp) from millibars to metres. This is done using the following formula:

$$p = \rho gh \text{ or } h = p / \rho g$$

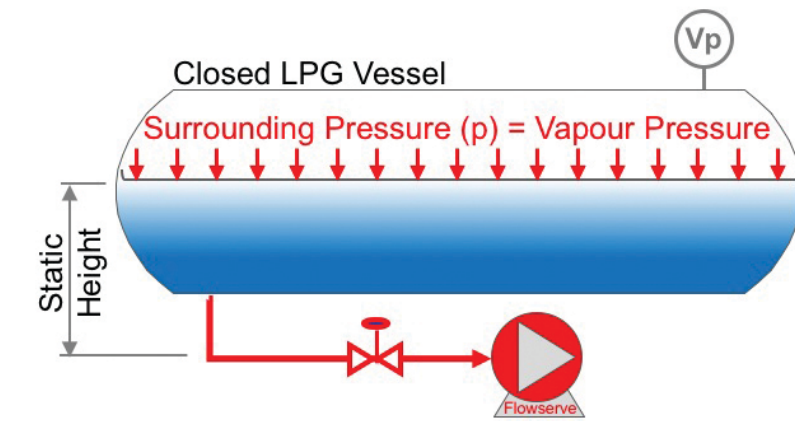
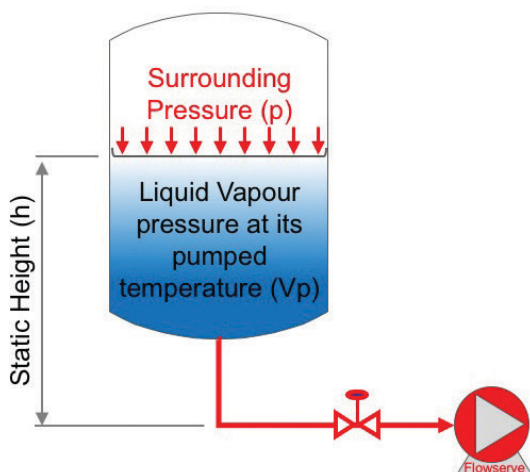
Where:

- p= pressure (pa)
- ρ= density (kg/m<sup>3</sup>)
- g= gravity (9.81m/s<sup>2</sup>)
- h= liquid column height above its datum (m)

### NPSH calculation

In an example where the system is pumping water at 50C with flooded suction and a positive height of 5m, the calculation is as follows:

- a. Static height: This is 5m
- b. Vapour pressure (Vp): At 500C, the vapour pressure of water is 0.12335 bar. This converts to 1.27m using the above formula.
- c. Pipework losses: This is an involved



LPG or any liquid at its boiling point.

- topic in itself, but for this example 0.5m is assumed.
- d. Surrounding pressure (p): In an open vessel this would be atmospheric pressure, but it could be much lower, especially in chemical applications, while a vessel is under vacuum. Assuming 1.014 bar, read from a barometer, the converted figure is 10.46m.

**Using these values, NPSH(a) = a-b-c+d = 5m - 1.27m - 0.5m + 10.46m = 13.69m.**

It would be good practice to allow a safety margin and 0.5m would suit such an application. So, we are now looking for a pump with NPSH(r) of less than 13.19m at the duty point on the pump curve. Most conventional end-suction liquid centrifugal pumps are in the region of 1 to 5m and would be suitable for this application.

**f: How do liquids close to their boiling point, or those under pressure such as LPG, affect the calculation?**

**SH:** Pumping LPG follows the same characteristics as any liquid being transferred at its own boiling point. Like boiling water at 100°C, its vapour pressure will equal the surrounding pressure and these two components ultimately cancel each other out. This leaves a calculation for NPSH with only two components, (a)

static height, and (c) pipework losses.

In an example with a minimum static height of 1.5m and pipework losses of 0.5m, NPSH(a) calculates as 1.0m

If a safety margin of 0.5m is also applied in this example, a pump with an extremely low level of 0.5m NPSH(r) at the duty point is required. Alternatively, by excavating the pump or raising the vessel, the static height can be adjusted to change the NPSH value. Or indeed the users can accept the results of the cavitation and the additional maintenance it will require. However, these alternatives are often expensive and impractical and low NPSH pumps do exist.

Low NPSH pumps are, arguably, better when constructed in a horizontal configuration. Unlike vertical pumps, any internal or entrained vaporisation can flow upwards naturally and escape through the discharge of a horizontal machine. Because the mechanical seal sits in the uppermost cavity of a conventional vertical pump it can become surrounded by vapour and its life can be compromised through insufficient lubrication.

It is also worth mentioning that the NPSH required for a conventional centrifugal pump can also be reduced by adding an inducer to the impeller. This volumetric feed screw type device induces flow into the eye of the impeller. Arguably, inducers are designed to operate in a very precise duty (flow vs differential head) envelope and become unstable when the user varies the process due to temperature, demand, speed, or simple valve opening and closing. ■

[www.flowserve.com](http://www.flowserve.com)





Image credit: Quartzelec

# Take the crisis out of an Emergency

AEMT 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 work 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.

Remember: [www.theaemt.com](http://www.theaemt.com)

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# High Efficient helical bevel gearboxes improve on old worm gearbox technology.

Chris Long of Yilmaz UK (new associate members of the AEMT in 2019), looks at how changing from a worm gearbox system to a helical bevel system can help lower costs and improve efficiency.

**The urgency of climate change is compelling businesses to look for better ways to lower their carbon footprint, increase the efficiency of their systems, and find more sustainable ways to conduct business. Improving efficiencies can also lead to improved productivity and so is necessary for a prosperous and stable future. Since the actual efficiency of any drive train can be no higher than its least energy-efficient part, choosing the right gear system for the task is an important choice to consider.**

Historically, worm gearboxes have been installed in many different types of industry applications because of their compact design and low purchase

cost. Despite these initial advantages, this product has a major disadvantage demonstrated in their low efficiency and durability. High friction and an increasing ratio between the worm and worm gear increases energy losses and decreases efficiency compared to other designs.

At high ratios, when efficiency is at its lowest, half of the motor power can be lost. When looking at the overall running cost of the machine's life, the cost of this loss can be very high indeed.

Improvements in gear technology has produced the helical bevel gearbox, which can claim to have all the advantages of a worm series gearbox such as a compact

## Helical bevel Advantages:

- High efficiency (%92-96)
- Low working temperatures
- Compact body
- Low purchase costs
- Wide ratio range (2-3 stages)
- Rigid monobloc body (GG25 material)
- Low noise

body and a low purchase cost, but also an improved efficiency.

## The rubbing point

In worm gears, as the gear ratio increases, so the efficiency decreases through the inherent sliding friction in the design. It is not uncommon for systems to be wasting 30% of the input energy. As friction in the gearset builds up, excess heat speeds up deterioration. What you end up with is a system of fans to reduce the increased heat and a gearbox which will inevitably have to be replaced once the gearset has weakened. To compensate for the wastage, larger motors are installed, and so yet more money is thrown at the system to try and get a satisfactory output.

To reduce friction in helical bevel gears a rolling friction is applied through the design of the gear mesh (see diagram), leading to almost zero rubbing or slipping of the components against one another. In turn, as the efficiency of the helical bevel gear has improved, a smaller motor can now be used, lowering the costs from the outset. Furthermore, a higher nominal torque value is also obtained when compared to the same size and similar ratio worm gearbox, meaning the service life is much longer.

Improving on the already better design is also possible when the gearsets are polished smooth and the unit is condensed with a monobloc design.

## A polished finish

Of the two common finishing methods to gearsets, grinding has proven to produce a better surface finish than lapping. When lapping with an oil lubricant, particles of the material are embedded into the surface, which can lead to an increased friction in operation. When grinding



the surface, however, those particles are removed, and striations left in the surface. After running in the machine these markings are removed further and a much smoother finish is achieved.

As shown in the performance comparison table, only a 0.75 kW motor is required for the helical bevel gearbox to produce the same output torque as a 1,1 kW motor being used with a worm gearbox. If the application runs 4000 hours annually, there would be an estimated saving of £262 per gearbox. The payback period on a helical bevel gearbox investment is therefore relatively short, especially if the annual working hours are higher than 4000 hours or if several gearboxes are installed. ■

### Performance Comparison

	Helical Bevel Gearbox	Worm Gearbox
Motor Power [kW]	0,75	1,1
Ratio	63,33	62,00
Output Speed [rpm]	22	23
Output Torque [Nm]	<b>303</b>	<b>274</b>
Gearbox Efficiency	93,0%	63,0%
Motor Efficiency	79,6%	81,4%
Annual Working Hours	4.000	4.000
Electricity Price [pence/kWh]	16	16
Annual Electricity Consumption [kWh]	3.769	5.405
Total Electricity Cost	£603	£865
Annual Savings	£262	-
Saving Ratio	30%	-

Yilmaz UK offer a range of 2 and 3 stage helical bevel gearboxes from their K0 Series. The machines are designed to have a high power output per unit volume. Built using a monobloc design, which has several advantages. Firstly, it means all axes can be machined in a single operation so that a high precision is achieved in production. Secondly, an improved mechanical stiffness is achieved, leading to less vibration, lower noise levels, and a more durable machine.

For more information about the applications and savings that can be made, please contact Chris Long on 07740 409 108 or by email at [chrislong@yilmazuk.co.uk](mailto:chrislong@yilmazuk.co.uk).

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**ENGINEERING**



## TEC Motors – continued expansion through customer satisfaction...

When the AEMT last visited TEC Electric Motors in 2016 (see Journal 16-2), they were operating from a 65,000 square foot site with stock levels of over £2 million. Three years later, their stock levels have grown exponentially to £12 million, and they have consolidated their warehouse and offices into a 100,000 square foot purpose build site on the Hartlebury Trading Estate, Worcestershire.

**TEC Electric Motors is a true success story, where continued investment and growth has seen the company relocate twice in the past 12 years to keep pace with the needs of its customers. Managing Director, Scott Edwards has no doubt that the company's achievement is rooted in an enthusiastic team that always puts the customer first.**

They are one of the UK's largest electric motor distributors, offering a wide range of products from stock as well as custom built motor units, gearboxes and inverters. With nationwide coverage, the company offers a true 24/7 breakdown service that delivers even on New Year's Day!!

Established in 2006, the vision was to create a motor distribution company that could be relied upon to provide excellent customer service backed by a wide range of high quality, reliable products. The business model was a success and within two years the company had outgrown its original premises and made its first move to accommodate the expanding stock inventory.

### Expanding business

By 2011, the warehouse was overflowing and demand continued to grow necessitating the purchase of an additional site - making space for the new gearbox department and the specials division. All the while the team continued



to grow and with each new addition, came increased product sales.

With a well-established headquarters in the Midlands, the next step was to open





the TEC North branch near Sheffield in 2013. This was closely followed by establishing a base in Scotland one year later with the opening of their Glasgow branch. Each of the satellite branches has a mirrored stock profile, albeit in reduced quantities, which ensures customers' needs are always met 24/7 365 days a year.

In 2018, the company achieved its biggest year in terms of sales, surpassing the £17 million mark, a major achievement in just 12 years. So, how has this been

achieved? Scott Edwards explains: "There is no doubt that everything we have accomplished is a result of teamwork; we have created a group of people that are dedicated to delivering customer satisfaction."

### Team building

In fact, when it comes to the sales meetings, everyone is invited to take part and see what the company has achieved, where it is planning to go and how they will get there. Everyone is involved in hitting the sales targets, from the

warehouse staff to the sales team and the technical support department.

Gareth Richardson, Sales Director, explains: "It is important that we listen to everyone when it comes to making improvements in our processes. In many cases, simple changes can make a big difference, so we make sure every employee has the opportunity to contribute their suggestions.

"The team we have built over the years is very loyal, to the point that several have







relocated their families when we have moved to new premises. That loyalty is repaid by the facilities we provide at work and our continuous efforts to improve the working environment.”

The team ethic is encouraged throughout the company and employees will often rotate jobs, learning new skills and making sure that every role can be covered when staff members are on holiday or sick. Taking on new roles brings a fresh perspective to the job and often results in process improvements.

### Stock holding

Over the years, TEC has increased its stock levels, to the point where it now has over £12million worth of stock ready to fill customer orders. This is made up of gearboxes, standard motors as well as special builds that are developed in partnership with customers.

In contrast with most distributors, TEC holds motors up to 630 kW on the shelf and the technical team can make

***Over the years, TEC has increased its stock levels, to the point where it now has over £12million worth of stock ready to fill customer orders.***

a variety of modifications that may be necessary to meet the requirements of an application. With full machining capabilities, motors can be modified with new shafts, encoders, brake units and cooling fans where necessary on reduced delivery times.

The warehouse contains both single and three phase motors as well as ATEX rated designs, a range of gearboxes and variable speed drives to match most applications. In addition, further products are available from Europe, where a joint venture holds around €50 million worth of stock.

With distribution key to their strategy, TEC have ensured warehouse locations in the North, Scotland, and Wales, to supply a growing number of re-sellers including AEMT members such as Beatsons Fans and Motors, Wilson Electric, Rotamech, , Deritend , Cleveland Electrical , Bellwood and numerous others. This growing mass of suppliers are all part of their overarching strategy to have a TEC motor available to anyone within 50 miles.

### Bespoke solutions

TEC Electric Motors has expanded its capability to include design changes to existing products, the creation of bespoke





motors as well as the delivery of matched motor/gearbox combinations.

Working with original equipment manufacturers (OEMs) TEC has developed bespoke motor designs that are a perfect fit for specific applications. Each solution can be supplied with marine or offshore C5M custom paint applications.

Having created the ideal motor solution, TEC also works closely with the OEM to establish the correct stocking levels to ensure that the production line always runs smoothly. Forward planning is a speciality at TEC and it is an essential part of delivering a reliable service to every customer.

This is enhanced by the flexible approach that TEC uses to ensure customer needs are met. Apart from providing a managed inventory that can cope with increased sales, the company also ensures that every delivery is best-suited to the customer’s needs. For example, if a forklift is not available to unload the delivery, TEC will make sure that the shipment is delivered by a tail-lift lorry; a small point for some, but this attention to detail can make all the difference in customer satisfaction and retention

### Going the extra mile

Of course, making planned deliveries is relatively straightforward. What really counts is the level of service when a customer has a more urgent requirement. Unfortunately, electric motors rarely break down at convenient times, so having a loyal TEC distributor network that honours the 24/7 promise is a major benefit.

This was illustrated in a recent case where a customer called TEC at 08:30 on New Year’s Day with an urgent request for a replacement motor. The warehouse was open within half an hour and a courier was arranged to collect and deliver the motor the same day. As a result, the customer’s operation was back up and running by 1:45pm.

Gareth continues: “This high-quality service helps to develop and convert emergency breakdown enquiries into regular, loyal customers, who know they can depend on us to always deliver. Of course, loyalty only goes so far in business, but with our high-quality products, competitive pricing and unfailing customer service, we have created a model that has delivered success year on year.”

As the business continues to grow, TEC continues to listen to its customers and put plans in place to meet new demand. David Ede, Business Development Manager, explains: “The next step is to increase our stock of medium and high voltage motors, to meet the demands of the water, mining and aggregates industries, amongst others. This is an area where, typically, there can be long lead times for new or replacement machines and this is something we want to address.”

### Consolidating success

TEC Electric Motors has been careful to build the necessary business infrastructure and put in place dedicated and experienced staff to ensure that every customer receives the level of service that they require. Scott Edwards concludes: “Everything we do is designed to improve the service we offer to our customers. We can deliver cost-effective solutions whatever the situation; from emergency replacements to inventory management and long-term manufacturing supply, anywhere in the UK and Ireland. ■

# Northern Meeting at Labman Automation

Labman Robotics is a unique company run by a unique individual! Based just north of the Yorkshire Moors in Seamer village, Andrew Whitwell's Labman Automation facility builds bespoke turnkey robotic solutions for use in product testing and scientific research. AEMT Member's were very lucky to get a glimpse into the inner workings of the company for their northern area meeting in March.

Labman's state-of-the-art headquarters are surrounded by beautiful countryside, and intended to engage the visitors attention immediately with huge slabs of timber cladding on the entrance. The open-plan facility is designed so that no hierarchical divisions hinder the constant flow of ideation. A large blue climbing wall, and fireman poles connecting the mezzanine landing to the ground floor could be seen as a flight of fancy, but it has enabled the company to attract crowds of young talented engineers who are critical for the development of the mechatronic systems and virtual worlds. Young employees benefit from bucket loads of enthusiasm, and can afford to take risks, which is an important ingredient to the success of the company.

While presenting to AEMT members, Mr. Whitwell explains that when you acquire a Labman system, you are buying a unique one-off piece of kit invented by the team, so mistakes are likely! Don't worry though, troubleshooting is expected, and all part of the package.

Focusing on robotics, we were also very honoured to have FANUC's Tom Bouchier at the event, providing members with an update on the company's direction and their new line of collaboration robots. The UK's uptake on robotics has been much slower than most European countries, although growth is certainly happening, it's important we catch-up for fear of losing the essential skills required for the future. "In most European countries that FANUC covers they see a lack of robot programmers and engineers. That is hampering companies from automating their production sites at the pace they would like to." ■



1. Bernard Darlington with Lee Windsor of Rewinds and J Windsor
2. Steven Crake of SimPRO Software speaks to Jennie Gordon
3. The Labman climbing wall.





- 5. Will Hogge of Labman gives members a tour of the facility.
- 6. Tom Bouchier presents to members about FANUC robotics.
- 7. Thomas Marks, Secretary of the AEMT presents Jennie Gordon with her honorary membership certificate.
- 8. Andrew Whitwell presents to members about Labman Automation.



# Jennie Gordon made AEMT Honorary Member

At the end of August 2018, Jennie Gordon retired from MGC Systems. Many will have met Jennie at AEMT meetings, who is easily recognisable with her flush of bright red hair.

Jennie has supported the AEMT for many years, encouraging several members to join over time. Although retiring from work, she still hopes to attend meetings to keep up with industry news, and the lifelong friends she's made through the association.

At the AEMT northern meeting at Labman Automation, Jennie was presented with

honorary membership in recognition for her years of support.

Honorary member's of the association are awarded to those who have made a special dedication to the association throughout their career. They are awarded at the discretion of the council.

Honorary member's benefit from a lifetime membership with all the perks

of being a regular member. They are also invited as honoured guests to regional events. ■



Jennie was supported to the meeting by her husband, Dave Manton, who also retired from the industry last year. On saying goodbye, the pair proudly showed off their new BMW K 1600 Bagger.



# Southern Meeting at Luton's Hayward Tyler Centre of Excellence.

The Hayward Tyler centre of excellence meeting near Luton was a very fascinating visit. Member's were treated to a tour of a superb facility where wet motor pumps are manufactured and hand wound. A repair shop, currently in development, was also available for members to tour around.

**The southern area meeting started from the Hampstead by Hilton hotel just next door to Hayward Tyler. Secretary of the association, Thomas Marks, gave an overview of the association, current developments and future plans. (for more details on this look at the AEMT News - page 10).**

Following the secretary, Simon Ellson, from ActionCOACH, gave an inspiring talk on how to turn your workforce into "Raging Fans!" – "If you don't have them in the work place, you will never have them as customers." Today's workplaces are experiencing changes at unprecedented rates.

The rise of digitization and automation, increased access to information, and the globalization of markets are among the trends challenging traditional approaches to work, company cultures, management and jobs.

Organisations everywhere are looking for strategies and tactics to stay competitive and grow -- and simply doing what they've done in the past will likely prove unsuccessful.

According to the presentation, 21% of the UK workforce are actively disengaged. These employees aren't just unhappy at work, they're busy acting out their unhappiness, undermining the business and all the good work engaged co-workers accomplish. How many engaged "fans" are there? Almost half at only 11%! While 68% of the workforce are somewhere in the middle, and just turning up for work, without actively



promoting the business, or undermining it.

Being a pump focused day, and to promote the partnership developing between the AEMT and the British pump manufacture’s association (BPMA), Gary Wilde, technical services officer, gave an in depth look at the pump market and pump efficiencies. For a detailed overview, please login to the AEMT website\* and download the presentation from the past event webpage. Gary also unveiled a look at the outline of a pump repair course being developed in partnership with the AEMT, the aim is to have a course in place by autumn 2019.

\*If you don’t have a login, please register (top right) first using your own company/ personal email address.

Following lunch, members made their way over to the Hayward Tyler centre of excellence for a brilliant and enthusiastic tour of the facility hosted by Raymond McKenzie (operations manager) and Michael Bendall (new product development manager).

Some highlights of the tour included the streamlined manufacturing setup with the rotors being built on the left side, and stator on right hand side to be married and tested at the end of the production line; dedicated cleaning, welding, and machining areas are boxed off to prevent contamination, and a special quarantine room required for returned equipment containing hazardous substances.

One of the biggest highlights though was seeing how many young, bright and enthusiastic staff the company employs, including a young female winder of the wet pumps, which is a promising sign for the future of the industry.

Watching them pull wind the wet pump was fascinating, using 6 very long encapsulated wire, the winders pulled the windings through out and back in again. The process can take a very long time with a machine taking between 60 to 200 hours. There’s also no need to varnish after winding as the coils remain sufficiently rigid in operation. ■



1. Robert Shoebridge, of W H Shoebridges.  
 2. Ray McKenzie of Hayward Tyler explains how the machines are covered up when not being worked on to prevent foreign bodies from entering the core.  
 3. Dave Cowles of Mid Kent Electrical.  
 4. Chris Birks of AEV.  
 5. John Savage of Mid Kent Electrical with Robert Shoebridge of W H Shoebridges





6. Wet motor winding on new Crusier technology, which are used instead of the overhead cranes to manoeuvre the machines.  
7. Two young winders from Hayward Tyler.  
8. Roger Bennett, of E Bennet Electrical.  
9. Paul Hirst of P.A.R. Insulation and Wires with Sam Agnew of the AEMT.

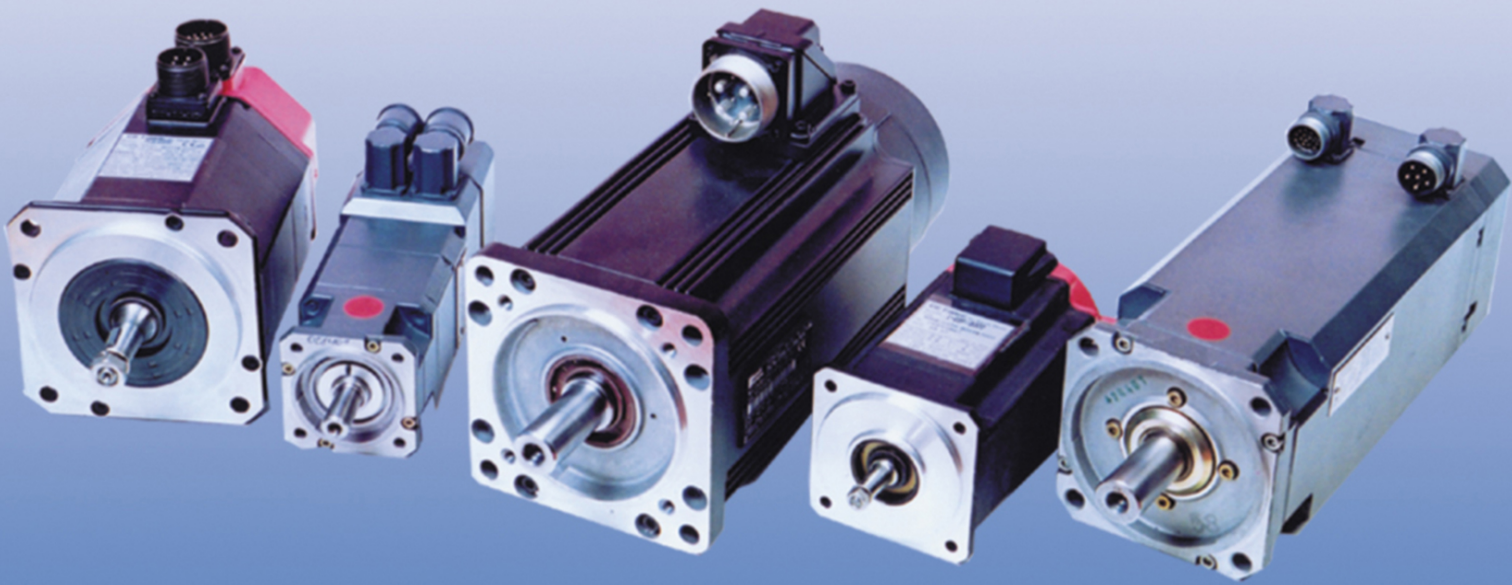


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