AEMT INTRODUCTION TO EX EQUIPMENT REPAIRS
A guide for users of Ex equipment

Wherever there are gas or dust atmospheres, there is the potential for explosions with disastrous results. One of the most serious examples of this in recent years was the Deepwater Horizon incident in 2018. The financial cost to BP of this avoidable catastrophe was some £65 billion. But more importantly, 11 lives were sadly lost, and the explosion started a chain of events which led to the largest marine oil spill in history. Thirty years before Deepwater Horizon, 167 lives were lost when the Piper Alpha oil platform suffered a catastrophic explosion.

It is easy to see, therefore, why legislation and schemes relating to hazardous areas and ensuring they are followed is essential. In the EU (and a few non-EU jurisdictions), this critical area falls under the ATEX (ATmosphères EXplosibles) Directive and elsewhere, the IECEx voluntary scheme.

EX-RATED EQUIPMENT

Six zones, three for gas and three for dust, are two standards – IEC 60079-10-1 for gasses and IEC 60079-10-2 for combustible dusts – based on the type of atmosphere and the quantity likely to be present. These, in turn, are reflected in the types of explosion protection (Ex protection) techniques or concepts required in products for use in the various zones. For electric rotating machines, for example, these include 'Ex d' for flameproof protection, 'Ex t' which covers dust, 'Ex e' which is increased safety protection, and Ex p for pressurised enclosures.

These techniques affect the design of Ex-rated electrical equipment compared to non-Ex-rated alternatives. As a result, electrical products, such as motors, designed for use in Ex zones differ significantly from those intended for safe or non-hazardous areas.

For example, some Ex-certified motors have enclosures that can withstand an internal explosion without rupturing. This

prevents any flame or explosive discharge from the enclosure from igniting the external atmosphere. Non-Ex motors do not typically have these rugged, explosion-proof features.

All Ex products designed for Ex zones are carefully engineered to control their surface and operating temperatures. This is crucial because certain materials may ignite if they come into contact with surfaces that are too hot. The design of these Ex motors ensures that their maximum surface temperatures are below the ignition temperature of the specific gas or dust present in the environment.

Motors and some other electrical equipment for use in Ex zones can have higher IP ratings, indicating a stronger capability to prevent the ingress of anything that would cause the protection concept to fail. Ex e, for example, is increased safety and designed to never cause ignition from heat, arcs or sparks, or the ingress of anything that could cause tracking between live parts that would cause the protection to fail. So, maintaining the IP rating protects internal components from substances that could create ignition.

Ex equipment also uses materials and components less likely to create sparks, for example the cooling fans of Ex rotating machines are anti-static, this prevents the potential of a build-up of a static charge. If a standard cooling fan is fitted and a charge is allowed to build this could be a potential ignition source.

The installation of Ex equipment should also meet the requirements of additional standards and training, as protection against the risk of sparks or heat is critical in hazardous areas. For example, cable glands and other wiring accessories need to be the correct type for the equipment and certified.

These design criteria for Ex-rated equipment often make repairing Ex-rated equipment a more involved and time-consuming process.

RESPONSIBILITY

The responsibility for ensuring compliance and safety in hazardous environments sits squarely with the

equipment user. This includes selecting and installing equipment for use in Ex zones, which must meet the relevant Ex standards from the outset. But it also includes any repairs to Ex rated equipment. The end-user is also responsible for ensuring any repair maintains the equipment's compliance to the original standard the equipment was certified too and complies with the ATEX directive. The Ex Repair Standard (BS EN IEC 60079-19:2019), which has been developed to ensure the safe repair, maintenance and overhaul of equipment used in hazardous areas, states that it is the... "user, organization or person which is the owner, or operator, of the equipment, that is primarily responsible for repairing it; not the equipment manufacturer or repairer".

INDIVIDUAL REQUIREMENTS

By its nature, repairing an electric motor used in an Ex environment is generally more complex and involved than repairing a similar one not used in a hazardous area.

The knowledge and skills required to service and repair Ex equipment, such as electrical rotating machines and other associated equipment, rests on two distinct categories of personnel, as highlighted in the IEC 60079-19 standard: the 'Operative' and the 'Responsible Person'.

The responsible person should be at 'craftsperson' level or above, trained to understand the different protection concepts of the equipment, how that concept works, what repair procedures can be carried out within that concept, and what repair restrictions are imposed by IEC 60079-19. And they need to be able to relay all this information to the end-user of the equipment.

The responsible person shall fully support the operatives and verify their work. The responsible person should also ensure that the correct records are kept and the appropriate quality control systems are in place for all Ex repairs.

They should be able to navigate the latest edition of the repair standard and understand which version applies to a piece of Ex-rated equipment being repaired.

Using the original standard to which the equipment was certified is critical. For example, in the 2000 version of the Ex d standard BS EN 50018, the table relating to flame paths gaps differs from those in the 2007 version, BS EN 60079-1, and changed again in the 2014 standard.

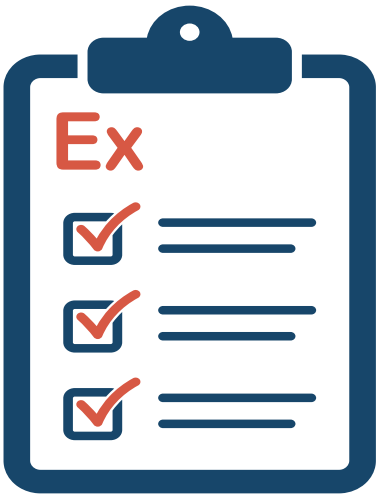
Operatives are the engineers and technicians who service and repair hazardous area equipment. They should have attended an appropriate Ex repair training course, such as

those provided by the AEMT, to fully understand the different protection concepts of the equipment they are servicing and, as already stated, what restrictions those concepts have when a repair is required.

TRACEABILITY

Traceability is also vital when looking at Ex equipment repair.

The repair standard says that the service facility must keep all documentation, including any drawings, electrical and mechanical measurements and readings, and all agreements in writing between the user and repairer for ten years. Ideally the equipment user should do so as well for their own records on site equipment.



If the repair facility uses a recognised quality management system, this will give the confidence that the documentation will be available if needed.

It should be noted that to repair Ex equipment being IECEx accredited is not mandatory. If the repairer does not use the international Ex repair standard or follow its guidelines, the user is primarily responsible for this. So end-users should understand this standard, be able to ask the correct questions of a repairer, know what documentation to expect, and be confident the Ex equipment has been returned fit for purpose.

THE EX REGISTER

One way to identify a repair facility that should be able to competently repair Ex-rated equipment and follows the relevant international standards, is to choose a repairer from the AEMT's Ex Register.

For a service/repair company to be listed on the register, engineers and technicians will have been trained by the AEMT covering requirements of the Ex equipment repair standard BS EN IEC 60079-19 and other relevant standards; the delegates on these training course are assessed during training and supported during and after the training.

Companies on the register should

have an ISO 9001 quality control system or equivalent in place; the calibrated equipment suitable for the work being undertaken will have been verified, and the required certificates.

A standards library shall be presented in the facility. It should also have at least one trained and competent operative, as well as one responsible person to supervise and sign off the Ex repair work completed by workshop technicians.

Both the responsible persons and operatives must be able to provide sufficient evidence that they are fully conversant with the theory, skills and practicalities of the Ex work they are involved with. They should also regularly attend AEMT refresher sessions (usually every three years) on the repair and overhaul aspects of Ex equipment. This means that all those companies listed within the AEMT Ex-register remain up to date on both the practical aspects of Ex repair and any changes in the associated standards and legislation, be they ATEX or IEC.

SUMMARY

Anyone can repair a motor that is being used in a hazardous area: anyone at all. However, the importance of the correct, safe repair of equipment for use in potentially explosive atmospheres cannot be overstated. Properly carrying out repairs is more involved and

time-consuming than similar repairs to non-Ex-rated equipment. It requires ongoing investment in specialist training, tools and systems by those organisations offering those repairs. And yes, it generally costs more than repairs to non-Ex-rated equipment. However, where the safety of people, the protection of the environment, and corporate reputations are concerned, there cannot be any shortcuts or corners cut. And remember, however a repair is carried out, the responsibility rests firmly with the end-user.

To find a service centre that carries out repairs to Ex-rated pumps, fans, generators, transformers, and motors, visit the AEMT Ex Register at bit.ly/AEMTEx