ExVeritas

Explosive Atmospheres

Essential Guidance Series

EGS 0035

Edition 1

Supplement for the CompEx Ex 14 training course.

The Responsible Person AKA Technical Person with Executive Functions

ExVeritas ®

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Prefix

Throughout this document, standards where they have been referenced have been listed against the International Electrotechnical Commission (IEC). For countries who are part of the European Union then the standards are prefixed with EN (European Norm) a harmonized standard for use within Europe, for locations outside the European Union i.e. rest of the world, then the standards referenced should be prefixed by IEC rather than EN, however after saying that, both standards are technically identical.

Ex Inspection Management – being the ‘responsible person’ under IEC 60079-17 standard.

Ex inspections will always make the plant safer and can also lead to lower running costs. The recently updated inspection and maintenance standard IEC 60079-17, at the time of writing this article this is Edition 5 of the standard dated 2013, gives additional details about how these inspections should be carried out and the responsibilities of inspectors.

Introduction

Installations in hazardous areas possess features specially designed to make them suitable for operations in such atmospheres. It is essential that in these potentially explosive atmosphere, the integrity of those special features is maintained throughout the life of such installations,

The IEC 60079 series of standards for electrical equipment in explosive atmospheres covers three very important areas that engineering personnel have to be aware of:

- Design, Selection and Erection (IEC 60079-14),
- Inspection and Maintenance (IEC 60079-17) and
- Repair and Reclamation (IEC 60079-19)

The inspection and maintenance standard IEC 60079-17 provides the details for the inspection and also the maintenance of electrical Ex equipment. In earlier editions of

the standard it did not inform us about was the actual methodology and strategy of how the inspections should be completed.

Time-Based Inspection Methodology

The most common approach for implementing periodic inspections is as a time-based inspection methodology (TBIM), this incorporates a visual or close inspection or a combination of both, which may then be supplemented by a percentage of detailed inspections at a set inspection period.

A great deal of experience and knowledge is required even to set a simple time-based approach to inspection. Environmental conditions, for example, must be known and thoroughly analysed and monitored.

Major factors affecting the deterioration of equipment include:

- susceptibility to corrosion;
- exposure to chemicals or solvents;
- likelihood of accumulation of dust or dirt;
- likelihood of water ingress; exposure to excessive ambient temperature;
- risk of mechanical damage and exposure to undue vibration.

Other service factors may include training and experience of personnel and the likelihood of unauthorised modifications or inappropriate maintenance.

The person who sets the initial and subsequent inspections, and verifies the suitability and effectiveness of the inspection regime is referred to in IEC 60079-17 as the “Technical Person with Executive Function” (TPEF) or the “Responsible Person” (RP).

This person must provide technical management of the skilled personnel (the inspection and maintenance team). They must have adequate knowledge in the field of explosion protection, having familiarity with the local conditions, be familiar with the installation and who has overall responsibility and control of the inspection system for the electrical equipment within hazardous areas.

The TPEF/RP is responsible for the maintenance and the inspection documentation (now referred to as the verification dossier in IEC 60079-14) including any modification records and the following items shall be recorded in the verification dossier:

Ex analysis

a) Zone classification of areas and, and if included, the equipment protection level (EPL) required for each location.
b) Gas and Dust equipment group (IIA, IIB or IIC and/or IIIA, IIIB or IIIC) and temperature class requirements and maximum surface temperature as required.
c) Equipment characteristics e.g. temperature ratings, type of protection, IP rating, corrosion resistance, vibration resistance etc.
d) Records sufficient to enable the explosion protected equipment to be maintained in accordance with its type of protection (see IEC 60079-14), for example list and location of equipment, spares, certificates, technical information.
e) g) Copy of the initial and subsequent inspection records as detailed in IEC 60079-14/17 and details of any repairs or maintenance.

Details on other aspects covered by IEC 60079-17 should also be included, including sealing (for area classification), mechanical maintenance on Motors (refer to Annex D of IEC 60079-17:2013) and the acceptance of equipment in old installations. A ‘Fitness-for-purpose assessment’ is defined in Annex C of IEC 60079-17:2013 for equipment where no certificate of conformity is available or the origin of a certificate cannot be verified. Fitness-for-purpose usually requires a full audit and assessment of the equipment, the equipment assessor must produce a technical report to justify the

continued use of the equipment and a labelled with the report number shall be affixed to the equipment.

In order to retain and review the required information, an ‘Ex register’ is required. This will normally be some form of electronic database that records all Ex Assets (including safe area equipment: Ex i barriers and overload tripping devices used on some increased safety motors, etc.) and all of the Ex equipment to be logged. This should now include protective systems, mitigation devices and non-electrical equipment (certified or risk assessed).

Risk Based Inspection Methodology

Whilst the time-based inspection methodology (TBIM) approach may be adequate, it may not be the most appropriate methodology. It may not, for example, be best from a safety point of view and also from a commercial or cost position.

Ex Inspections is designed to be ‘preventative maintenance’, but if you inspect something annually (yearly) and find an ignition-capable fault, the fault may have been there for 364 days! If you fix it (for example replace a gasket) it may be that the fault re-occurs quickly due to some common environmental condition (such as the atmosphere degrading a certain type of neoprene seal) and the equipment may be almost permanently unsafe, despite being inspected regularly.

Simply put, high risk equipment located in high risk areas should have a greater frequency of inspection. Low risk equipment located in low risk areas should be inspected at a lesser frequency of inspection.

Based on the above the risk based inspection methodology (RBIM) approach has been introduced, and although still in its infancy this approach will increase in the coming years because of the benefits.

Asset recording

Many people confuse zones (classified areas) with risk. A zone is simply a three-dimensional bubble in a defined location identifying the likelihood and duration of an event e.g. how often the event (release) occurs and if it does occur how long it lasts, release, and we also attach a dimension to that release. A risk is a combination of the likelihood of the release combined with the likelihood of the ignition being present. - we now refer to this as the 'EPL- Equipment Protection Level - multiplied by the consequence of the explosion.

So in terms of risk, a large Zone 2 IIC area may be a higher risk than a small Zone 1 IIA area and the proximity of people or other fuel storage areas (the potential 'domino' effect) may also create a far higher risk than a zone might indicate.

The Energy Institute (EI) introduced a guidance document in October 2008: "Guidelines for managing inspection of Ex electrical equipment ignition risk in support of IEC 60079-17". This guide has been produced in conjunction with the UK HSE and major users such as BP, Total and Shell. The EI methodology is the Risk Based Inspection (RBI) approach, which can reduce inspections and shutdowns and provide increased frequency between inspections without compromising safety or reliability. The benefits of RBI include improved risk management results, increased plant availability and reduced unplanned outages.

This is based on the fact that equipment which is more critical to safety is inspected at a greater frequency than equipment that may have a lesser impact on safety of personnel or plant integrity.

The RBI examines the health and safety environment and business risk of 'active' and 'potential' damage to assess and rank failure probability and consequence. This ranking is used to optimise inspection intervals based on site-acceptable risk levels and operating limits, while mitigating risks as appropriate.

Organisations should always look at previous inspections and maintenance and apply the lessons learnt to the future. Annual integrity reports should be in place so that modifications and repetitive faults can be trended and hence eliminated.

Photo 1: Main Fan inspected every six months

Photo 2: Standby Fan inspected every four years

Summary

It is not enough just to conduct Ex Inspections - you must have policies, strategy and programmes that identify a clear and concise route, not only the for inspection, but also for the maintenance and including corrective actions, which should be undertaken on the facility.

You must be able to demonstrate that your strategy and programmes are effective and that they maintain (or ideally reduce) the level of risk which has been deemed acceptable for your plant, people and inventory.

The responsible persons or 'Technical Persons with Executive Function' have an absolutely key role in the explosion safety of a plant. The minimum knowledge requirements for a person in such a role are covered by IEC 60079-17 and are:

a) A general understanding of relevant electrical engineering;
b) A practical understanding of explosion protection principles and techniques;
c) The ability to assess engineering drawings (area classification, P&ID etc.);
d) A working knowledge and understanding of area classification, installation and repair;
e) A basic knowledge of quality assurance, including the principles of auditing, documentation, traceability of measurement and instrument calibration.

The competency of people in these key safety roles has to be verified and attributed, at intervals not exceeding five years on the basis of sufficient evidence that the person is competent across the specified range of activities and has the relevant knowledge and understanding underpinning the competency.

To assist with competency assessment, the HSE has worked with CompEx to produce the CompEx Ex14 - Responsible Person Module. This aims to assist responsible persons meet their legal obligations with regard to maintaining an Ex asset and inspection register and implementing a practical approach to the inspection and maintenance of equipment in explosive atmospheres using IEC 60079 Parts 14 & 17 and offering the basis of best practice in this regard.

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