ATEX / IEC Hazardous Area Design – Competence Required

Introduction

Hazardous area standards used in Europe and many other parts of the world have undergone significant changes in the last 18 months. Many of these changes are directly relevant to manufacturers of skids, electrical systems, and equipment assemblies.

The changes include a new installation standard (EN / IEC 60079-14), new or revised protection concepts, new equipment selection methodologies and new equipment groupings - but one of the most notable and important changes is the requirement for **mandatory** training and competence verification for personnel who are involved in the design of ATEX and IEC equipment and systems.

Training & Competence for designers of such equipment and systems is also good business practice, since knowledge and understanding of the requirements will lead to faster, less costly construction which meets all the relevant standards. Having a system or equipment designed correctly from the outset will also greatly reduce the time, cost, and effort to achieve any necessary certifications, as well as eliminating the cost and embarrassment of having to "re-work" a design or construction.

Why Do You Need It?

The new edition of the installation standard – published in December, 2007 - specifies in some detail the training and skill requirements for people who are involved in design, equipment selection, assembly, and management of assemblies, equipment, systems, and circuits meant for use in hazardous (potentially explosive) atmospheres. Such designs or constructions are covered by the ATEX Directive and must comply with the standards set forth in the EN or IEC 60079 series of standards.

Purchasing and assembling ATEX-compliant equipment does not alone produce a certified ATEX assembly – further assessments, technical documentation, and possibly testing will be required to ensure that the assembly meets the standards. 3rd party review by a notified body may not always be necessary, but the manufacturer must be able to demonstrate via the technical file that the equipment has been designed, built, assessed, and documented properly and in strict adherence to the standards – and that all work has been completed by trained, competent personnel, along with verifiable evidence that such training & competence evaluation has been carried out. Many of the parts and assembly will not be verifiable by inspection or review, therefore the demonstrated competence of the persons designing and installing the equipment will be extremely critical to ensuring that the assembly meets all relevant requirements.

Ultimately, the competence levels of the people involved in this activity will determine the safety and compliance of the final assembly.

When is it relevant?

Use of the standards becomes necessary as soon as a manufacturer begins to design a system or equipment for use in hazardous areas which fall under the ATEX directive. The standards specify everything from cable selection, cable gland selection, materials of construction (any metal or plastic), electrical parts, non-electrical parts (such as valves, pumps), and even warning signs. Even something as simple as mounting a flameproof (explosion proof) motor in a box for weather protection needs to be done according to installation standard – along with conducting and documenting a risk assessment.

Why? The answer is simple: the installation and other relevant design standards give specific constructional requirements for explosion protected equipment that must be complied with in order to meet the ATEX directive (or you must produce evidence, such as test reports, showing why any deviation is safe).

Failing to follow the standards in design & construction can have severe consequences. ATEX and the EN/IEC standards exist for one main purpose – preventing the ignition of potentially explosive atmospheres. Such explosions can be catastrophic, both in terms of lives lost or injured and financially – several recent explosions have resulted in significant loss of life and have cost the companies involved billions of dollars in repairs, fines, and lawsuits. In addition, since most ATEX and IEC equipment will be inspected against the requirements of the standards prior to being commissioned, deviating from those standards incurs the risk of significant re-work, particularly in Europe where an inspection against the installation standard is normally required before commissioning (referred to as an 'initial inspection')

Evidence of training and competence for the designers, installers, and personnel involved in the management process may even be requested by a regulatory authorities or your end client. This is rapidly becoming a required deliverable for new complex assemblies where it is difficult to re-check every aspect of the installation; therefore more reliance must be put on the competence of the staff involved in the initial design and specification.

Controlling the Mandated Competence & Training Levels

Competencies apply to each of the explosion protection concepts for which the person is involved. For example, it is possible for a person to be competent in intrinsically safe equipment only but not in flameproof or increased safety equipment. Due to the complexities and range of engineering disciplines within explosion protection - ranging from heavy current to micro-electronics to mechanical design to

process engineering - it is rare to have someone who is expert in ATEX or 'explosion protection' in general. Most engineering staff only need to be competent in the range of activities required for their job function within an organization - therefore each manufacturer should define both the levels of competence necessary and quality system requirements for each member of their staff. A program should then be put in place to ensure that all staff involved in designing, constructing, or overseeing work on equipment destined for use in hazardous areas has the correct training and competence assessment, along with timescales set for re-assessment and/or re-training – due to the dynamic nature of the standards and technology, re-training & assessment of competency is required at a minimum of every 5 years.

There are three basic types of training the standards define for ATEX and EN/IEC. It should be noted, however, that these should be viewed as a minimum - there are many cases where manufacturers would require additional competences. For example, if you manufacture equipment that holds, processes, or generates a flammable atmosphere your personnel may very well require knowledge of 'area classification' and process safety.

In the manufacture of rigs, skids or modular plant components where process safety is necessary, knowledge of "Safety Integrity Levels" (SIL) and protective devices may also be required. Any device that protects against the affect of an explosion - such as a flame arrestor - will need to be ATEX certified. It is not, however, as simple as buying a certified part and installing it - to determine if you need a flame arrestor, deflagration arrestor or a detonation arrestor, you would need to know what flame speed you would expect in a pipeline or vessel. As you can see, training and knowledge of the standards can be crucial to designing and building ATEX-certified equipment.

This article, however, will focus on the requirements for ATEX Equipment **Designers**. It should be noted, however, that "Responsible Persons" - those responsible for the processes involved in the design, selection and manufacture of the assemblies, as well as installers, all have their own specific training requirements. In the case of installation personnel, these requirements including assessing their practical skills and ability.

Designers Competence Requirements

Case studies of many recent explosions have shown that it was the **fundamental design** that was unsafe, even when the equipment was correctly built and installed. An incorrectly specified level switch or an impractical maintenance procedure can have devastating impact on the overall installation, and can be the direct cause of a potentially catastrophic explosion – therefore the training & assessed competency of personnel involved in designing such equipment and systems must be given serious consideration.

Obviously the standards will be applicable to companies who design plants and facilities - but they are equally applicable to companies who supply project engineering or manufacture rigs, skids or assemblies for use in hazardous areas, including equipment which will be located in a safe area but which has functionality involved in preventing or mitigating an explosion in the hazardous area.

According to the Installation Standard, Designers must possess, to the extent necessary to perform their tasks, the following skills:

- Detailed knowledge of the general principles of explosion protection; this would include knowledge of terms such as LEL, MESG, Flashpoint and factors that affect dust and gas explosion properties (pressure, temperature, oxygen etc).

- Detailed knowledge of the general principles of types of protection and marking; this would include all of the electrical concepts such as ic. ma. etc., and group markings such as IIB+H2 (Gas) or IIIC (dust) and EPL's.

- Detailed knowledge of those aspects of equipment design which affect the protection concept – which may include SIL's if safety or protective systems are used, and in-depth design knowledge if concepts such as "constructional safety" are used.

- Detailed knowledge of content of certificates (such as use of the "X" or "U") as well as the many types of certificates and issuing bodies.

- An understanding of practical skills for the preparation and installation of relevant concepts of protection (full knowledge of the installation requirements).

- Detailed knowledge of "Permit to Work systems" and safe isolation (as related to explosion protection), as well as process and procedure documentation - most explosions occur during start-up, shut-down, or maintenance!

- Detailed knowledge of the particular techniques to be employed in the selection and installation of equipment referred to in IEC/EN 60079-14 and a general understanding of Inspection and Maintenance requirements of IEC/EN 60079-17.

Designers must be able to provide evidences of having attained the knowledge and skill requirements listed above, relevant to the types of equipment and protection schemes involved, and MUST be able to demonstrate their competency with documentation – such as a "Design Competency Certificate.

Conclusion

ATEX and EN / IEC standards are constantly evolving and changing as technology, techniques, and knowledge emerge. In order to ensure their products or systems

are designed and constructed in accordance with the most up-to-date standards, companies must take a new approach to gain - and maintain - personnel competence. Building equipment to an ATEX or IEC specification is a complex task involving multiple skills and detailed knowledge of the very principles behind explosion protection. Engineers who design equipment for use in North America may be familiar with the requirements of NEC for explosion protection – but ATEX and IEC are vastly different and have substantial documentation and quality control requirements. It is vital for both safety and project risk that the people involved with the design and specification of the equipment are technically compliant and aware of both the specification (legal compliance) and safety issues involved.

One of the most often missed points for manufacturers is that they frequently "over engineer" the project when asked to build to an ATEX specification – such as using expensive ATEX equipment with long lead times where it may not have been necessary. Competence in this field is not just about knowing what you "have to do", - it is also about knowing when there are other, less expensive options that are just as suitable and compliant under ATEX. Such knowledge can be priceless – far outweighing the cost of obtaining it!