Conversion from Division to Zone classification

- why and how the world's largest oil company made the change

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The introduction in the late 1990's of the Zone electrical area classification concept into North American standards provided the catalyst for a major international oil Company based in Saudi Arabia to convert from the ›Division‹ to the ›Zone‹ method of area classification.

The Company initially relied on North American standards to purchase materials but, over the years, sourcing of materials, and design and construction services gradually shifted away from North America. This required the Company to restructure their standards and accept materials and installation practices from all over the world. Today, the Company standards accept materials and installation techniques from a variety of international sources.

The Zone classification system was considered to provide the maximum flexibility and safety in hazardous locations. Therefore, it was considered preferable over the Division system from a cost, safety, maintenance and reliability viewpoint. In late 1999, the Company decided to convert from a Division to Zone Classification system.

This paper will discuss details of why and how the Company made the change and the impact of the migration on electrical and instrumentation installations within the Company.

Introduction

Since the company's inception over 50 years ago, company standards have required that electrical classification of processing facilities be based upon the Class/Division/Group method.

The decision to change from Division to Zone classification was not an easy one. There were a number of issues to be considered. Some of the considerations were common within the process industry and others were specific to the individual operating environment of the Company.

With few exceptions, most of the Company plants have very small Division 1 areas, surrounded by extensive Division 2 areas. Division 1 areas typically involve electrical equipment and instrumentation associated with ship loading, tank inventory, monitoring systems, and in-line process analysers. Due to the limited extent of Division 1 locations, in the majority of installations, the benefits of using the Zone classification system is not obvious.

Company policy is to contract and purchase on a worldwide basis. This requires application of electrical equipment in hazardous areas that are designed and approved based on both North American and International, Electrotechnical Commission® (IEC®) standards.

The Company standards have, for many years, allowed combinations of IEC and North American equipment. It was recognized that there would be advantages to migrating to a ›Zone‹ classification system. However, since Company installation practices are based on North American codes and practices, until the National Electrical Code® (NEC®), American Petroleum Institute®, (API ®), and other North America standards adopted the Zone classification system and provided guidance on equipment application in both Zone and Division classified areas, the Company standards remained solely based upon the Division classification system.

Neither the ›Division‹ nor ›Zone‹ system is overwhelmingly superior, however, the benefit of the ›Zone‹ system simplifies the application of equipment built to either North American or European standards. Despite this benefit, changing from Division to Zone classification was a major decision. The conversion required planning, investment of time in changing standards and an ongoing effort in educating engineers, inspectors, and operations and maintenance technicians.

Corporate Standards

Standards Structure

The design and construction of Company facilities is governed by a family of documents consisting of materials specifications, engineering standards, and standard drawings. By corporate policy these documents are mandatory. Deviations and questions of interpretation must be directed to the corporate engineering organization. Deviations must be supported by this organization and formally approved by the managers of the engineering and inspection departments.

Role of Standards

Given the background of the Company, it is not difficult to understand why the engineering codes and standards have traditionally been North American based. The NEC is a key part of Company standards and heavily influences electrical installations in Company facilities. Therefore, an electrical engineer working in a process facility on the Texas Gulf coast would be very familiar with electrical and instrumentation installation practices in Saudi Aramco facilities.

Although the Company has plants that date back to the 1940s or earlier, the majority of the existing facilities were constructed during the 1970s and 1980s when production was expanded and a system was put in place to collect and utilize gas, produced in association with crude oil. In addition to the NEC, other basic reference standards used for electrical equipment and installation include: ANSI, IEEE, NEMA, ICEA, AEIC, UL, ISA, etc. These references, which now include references to IEC equipment standards for some equipment , are supplemented by fairtly extensive Company standards that provide additional specific requirements that are not spelled out in the reference standards. In some cases, Company standards delete or modify the reference standard requirements.

Accommodating international Equipment Suppliers in Division Based Company Standards

Most electrical equipment supplied to the Company that is not manufactured to North American standards, is built to IEC or IEC based standards. For this reason, the following discussion relates primarily to the application of IEC based equipment.

Two approaches have been used in the past to accept equipment and material manufactured to IEC standards. The first was for engineers in the corporate engineering department to perform an evaluation of the proposed equipment or material on a case-by case basis to see if it provided equivalent functionality and safety to North American standards based equipment for the specific application. The second, and preferred approach, was to modify the Company standards to define conditions and requirements for use of equipment and material →

manufactured to IEC standards. Adoption of the Zone concept for the classification of hazardous areas will almost eliminate the need for case-by-case evaluations.

In the early 1980s Company standards were modified to define parameters for use of cables manufactured to IEC standards in hazardous (and non-hazardous) locations. Subsequently, additional requirements were added to allow safe use of other equipment built to IEC standards in hazardous locations. The following are some examples of modifications made to Company standards to adopt equipment manufactured to IEC standards:

- Cables
  For cables, the requirements are relatively straightforward. Low voltage IEC type cables are required to be built to IEC 60502-1, be rated 600/1000 V and a minimum of 85°C, and meet the flame test of IEC 60332-2. Medium voltage cables are built to IEC 60502-2 and to the additional requirements of a Company material specification. Both medium voltage and low voltage cables are permitted in hazardous locations any place where ›cables having similar construction to those listed in NEC Article 501-4 (b)‹ are permitted. Steel wire or steel tape armoured cables built to IEC 60502-1 or 2 can be used in lieu of Metal-Clad (MC) cable except in Division 1 locations.

Requirements for other equipment and materials are more complex.

- Flameproof enclosures
  Flameproof EX d II enclosures were permitted in Division 1 and 2 locations provides that:
  - NEC requirements for cable entry are met.
  - The overall enclosure is rated EX d II.
  - The enclosure is metal or has an integral bonding device.
  - If used outdoors the minimum degree of protection of enclosure is IP 56.
- Conduit Fittings
  Ex d conduit fittings were permitted with the exception that only conduit sealing fittings approved by North American testing agencies are permitted. This was due to past problems with conduit sealing fittings approved in Europe.
- Cable Sealing Fittings
  Ex d ›barrier type‹ cable sealing fittings (i.e. include a poured or compound type material to fill the interstice within the conduit or cable) are permitted for use with enclosures required to be sealed by the NEC. Ex d ›non-barrier‹ gland fittings that do not incorporate a sealing compound are not permitted for use with Ex d enclosures. The requirement for Ex d ›Barrier type‹ seal fittings was originally intended to meet the apparent intent of the NEC which only refers to seals that use a sealing compound. This requirement for a ›barrier type‹ cable seal has been reinforced by ISA 12.22.01 which requires ›poured‹ or ›moulded‹ seals for use with ›direct entry‹ enclosures.
- Switch racks
  The Company specification describes the minimum features required in the equipment and allows the manufacturer the flexibility of building the switch rack with a combination of ANSI/NEMA or IEC material and installation techniques.
- Instrument Protection Methods:
  Ex ›n‹ (non-incentive) instruments were allowed in Division 2 areas and Ex ›ia‹ (intrinsically safe) instruments or instruments in Ex d II enclosures were required in all Division 1 locations. The use of Ex ›e‹ (increased safety) junction boxes and terminal housings was limited to Division 2 applications only.

Inspection Authority

The Company is its own ›inspection authority‹. There are no comprehensive national standards or national regulations governing third party inspection. The responsibilities of the ›authority having jurisdiction‹ mentioned in the NEC are with the corporate engineering department.

Zone VS Division

Requirements Outside the United States [1]

The major organization for worldwide electrical standards is the International Electrotechnical Commission (IEC), based in Geneva. Technical Committee 31 is responsible for all hazardous area equipment.

As a result of the European Common Market initiative, a directive was issued in the 1970s to harmonize the standards for electrical equipment used in hazardous areas. The purpose was to facilitate trade. The European Committee for Electrotechnical Standardization (CENELEC) was assigned this task and directed to base their new standards on the IEC. This work was completed and the standards were published. These standards are similar to the IEC standards, but not identical, thus process of reconciling the differences is ongoing.

In addition, to the Common Market, many Western European countries adopted the standards. The Common Market eventually evolved into the European Community (EC) and in the 1980s directives were published that required the member countries to incorporate the CENELEC (i.e. EN) standards into their national standards. In 1994 the ATEX Directive 94/9/EC was issued, which mandated that all equipment put into service after June 2003 have the ›CE‹ mark affixed to it indicating conformity to the EN standards.

The CENELEC standards require hazardous areas to be classified in ›Zones‹ instead of the ›Divisions‹ as used by the U.S.A. There are a number of other countries that use the Division system or a mix of systems, but the majority of hazardous areas in the world, outside North America, are now classified using the IEC Zone concept.

Differences between Classification Methods

Papers [4], [5], [6], [7] and [8] are excellent in explaining the differences between the Zone and Division systems. Basically the difference is shown in Figure 1.

Differences in Equipment Construction and Installation

The main differences are with the material of construction, basis of wiring methods, protection techniques, and labelling.

- Material of Construction
  There is a higher use of plastics with IEC equipment than with North American equipment.
- Wiring Methods
  The design of IEC equipment is based heavily upon the use of cable systems as opposed to extensive use of conduit in North American installations.
- Protection Techniques
  Both systems rely on the fundamental design concept of either breaking the ›fire triangle‹ or letting the explosion occur and controlling the gas release. Therefore, the techniques of pressurization/purging, explosion proof (i.e. flameproof), hermetically sealed, encapsulation, oil immersion, intrinsically safe are used by both North American and European equipment.
  A significant difference with IEC equipment is the ‹Increased Safety‹ (Ex ›e‹) protection concept. This eliminates, as a variable, the possibility of a termination being an ignition source. This protection technique isn't paralleled in the NEC for locations classified under the Division system. Increased safety would not be permitted by the NEC in a Division 1 location and is not required in a Division 2 location. An increased safety termination can be used in a Zone 1 location without being inside a flameproof enclosure. As per the NEC, in a Division 1 location, an equivalent termination would have to be inside an explosion proof enclosure.
- Labelling
  Both North American and European equipment require labelling which give the information necessary to verify suitability for installation in the area.
  The difference is that, as per the NEC, a portion of the labelling has to directly indicate whether the equipment is suitable for the areas (e.g. must be labelled ›Class 1, Zone 2‹). IEC does not require this information. The ATEX Directive 94/9/EC, however, will be mandating additional labelling requirements for the Member States of the EC.

IEC	Zone 0	Zone 1	Zone 2
NEC	Division 1		Division 2

Figure 1: Comparison of Zone and Division Systems

History of ›Zone‹ integration within NFPA/API

The establishment of the EC and the movement of the EC to harmonize standards kick-started the U.S. electrical community into debating the Zone issues. Adaption was necessary for the U.S. to remain competitive in the world marketplace.

Prior to the mid-1980s any proposal to redefine or expand the Division system was rejected by the NFPA. During, and after the 1984 code cycle, debate intensified on the adoption of a three Division system (i.e. 0, 1 and 2 or 1.0, 1.1 and 2). Amendments were proposed for the 1993 NEC but they were not accepted [2].

After the 1993 NEC, debate over a three level classification intensified further. This resulted in the inclusion of a three level Zone method of classification within the 1996 NEC as Article 505. There were three important caveats to this inclusion:

- Classifying to the Zone system had to be under the supervision of a Registered Professional Engineer,
- an appeal was issued to the articles associated with the Zone system after the 1996 NEC was issued and
- the NEC required equipment that was installed in a Zone area be listed and marked with Class, Zone, Gas Group and Temperature Class.

The consequence of the last point was that a facility could be classified to Zones but there was a limited selection of equipment approved for installation.

In 1997 API created RP505 [3] Recommended Practice for Classifications of Locations for Electrical Locations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, and Zone 2 to serve as a supplement to the NEC.

The 1999 NEC included API 505 as a reference standard in Article 505. All the caveats from the 1993 NEC remained with the exception of (2), the appeal. The marking requirement was expanded in the 1999 NEC to include the requirement for the symbol ›AEx‹ as well as the equipment ‹protection techniques‹.

The 1999 NEC provided better guidelines for Zone classification but imposed additional labelling requirements that limits the selection of equipment, which can be installed to those certified by North American approval agencies.

Why the change to Zone classification?

Historically, the Company has relied heavily on the NEC. Over the last 10+ years there was a gradual evolution of the Company standards to accept more and more deviations from the NEC related to alternate installation techniques and equipment. This was as a result of the following:

- Experience gained from building facilities with international contractors and suppliers
- Need for more corrosion resistant products for offshore/near shore environments
- Proximity to, and interaction with European and Asian manufacturers and suppliers of IEC equipment
- Availability of locally manufactured IEC products
- Flexibility to use ‹engineering judgment‹ since there were no constraints imposed by national/local regulations

The result was that the Company's standards were modified over time to allow a limited mixture of IEC and North American equipment and installation techniques.
In addition, the Company material specifications for items such as electronic instrumentation, switchgear, controlgear (i.e. motor control centers), switch racks etc. evolved to accept designs built to either North American or IEC based standards.

When considering the switch to the Zone system of hazardous area classification, several advantages were identified. The key advantages were:

- Allow the selection of a broader range of materials and installation techniques,
- Eliminate the confusion and possible misapplication of Zone certified equipment in Division classified areas, and
- Align the Company with, what we believe will be the future international standards.

As mixtures of equipment and installation methods were occurring based on guidelines in corporate standards, the adoption of the Zone concept was seen as increasingly desirable, but not considered practical, given the primary reliance on the NEC and other North American standards. The issuance of API RP 505 in 1997 removed most obstacles to the conversion process and the Company began the process of adopting the Zone concept in mid-1999. Furthermore, the decision to change was more comfortable given the fact that a reputable, national code making body (i.e. Canadian Standards Association® (CSA®)) via the 1998 Canadian Electrical Code® (CEC®) had adopted a Zone concept essentially identical to what the Company wanted.

In late 1999, standards revisions were drafted to begin the migration of the Company exclusively to the Zone classification method.

How the change to Zone was accomplished

The mechanism used to implement the change was a rewrite of the Company engineering standard SAES-B-068 ›Electrical Area Classification‹. This revised standard requires the following:

1. All new facilities, or extensions to existing facilities be classified by the ›Zone‹ method using API RP 505 as the guideline

The following is the wording in the standard:

›Area Classification Drawings shall be developed for all facilities where flammable liquids, gases, or vapours are produced, processed, stored or handled. This applies to new facilities, or extensions/additions to existing facilities. The classifications shall be performed using the Class I/Zone/Group method per guidelines within API RP505 and this standard.

Exception: Extensions/additions to existing facilities already classified by the ›Division‹ method can be classified by the same method with approval of the Chief Fire Prevention Engineer.‹

Although problems are not anticipated with the intermixing of the classification systems, it is recognized that it would be best if the entire facility were classified using the same method. By default, however, the above wording requires a new area classification to, or within an existing ›Division‹ classified facility, be classified by the ›Zone‹ method.

2. Existing ›Division‹ classified facilities which have been extended to be reclassified to ›Zone‹.

The following is the wording in the standard:

››If a ›Zone‹ classification is added to an existing facility that was classified by the Class I/Division/Group method, it is highly

recommended that the entire facility be reclassified to the ›Zone‹ classification. Refer to the guidelines within this standard to perform this reclassification.

Commentary: Although using the ›Zone‹ and ›Division‹ systems in different areas of the same facility is not prohibited, to maxi mize the long-term operational benefits it is best if the entire facility is converted to a consistent ›Zone‹ classification system«.

The ›guidelines within this standard to perform the reclassification‹ mentioned above are the following

- Change ›Group A‹ and ›Group B‹ to ‹Group IIC
- Change ›Group C‹ to ›Group IIB‹
- Change ›Group D‹ to ›Group IIA‹
- Change ›Division 2‹ to ›Zone 2‹
- For Division 1 areas around a source located in an open area change to ›Zone 1‹
- For Division 1 areas in an enclosed area, contact the Chief Fire Prevention Engineer for guidance on changing ‹Division 1‹ into ›Zone 1‹ and/or ›Zone 0‹.‹

This is summarized in the Figures 2 and 3.

3. After the classification is performed, the expectation is that the majority of the area that is classified will be Zone 2

Left open, the natural tendency of contractors accustomed to applying IEC equipment and installation techniques would be to have much larger Zone 1 locations than we expect or think is required. This would defeat the objectives of migrating to the Zone system since the North American equipment selection would be limited and North American equipment would probably be at a competitive disadvantage in a Zone 1 environment. The following is the wording in the standard:

5.3
The development of the electrical classification drawings shall follow the guidelines presented within API RP 505. These drawings shall be produced as part of any project proposal, final design, and as-built issue of drawings for any capital or maintenance project that creates or changes the extent of an electrically classified location. The drawings hall, as a minimum, show the following information:
5.3.1
The demarcation of the Zone 0, 1, 2 and unclassified areas, both vertically and horizontally via plan, elevation, and section views.
5.3.2
The minimum ignition temperature of the mixture of gases/vapours creating each classified location.
5.3.3
The type of gas or vapour in each of the classified areas. This shall be presented as either the name(s) of the gas/vapour or by the Group II A, B or C designations defined within API RP505.

Commentary 5.3
It is expected that Zone 0 areas will be extremely limited in scope. Since Zone 0 usually exists as only closed systems which are vented to the atmosphere, most general classification maps will not show Zone 0. Zone 0 may be non-existent in facilities where release sources release into an open area. Zone 1 areas will be more common but will rarely be larger than a Division 1 areas found in similar areas classified under the Division system, in most cases classified areas should be composed of small Zone 1 areas surrounded by much larger Zone 2 areas.‹

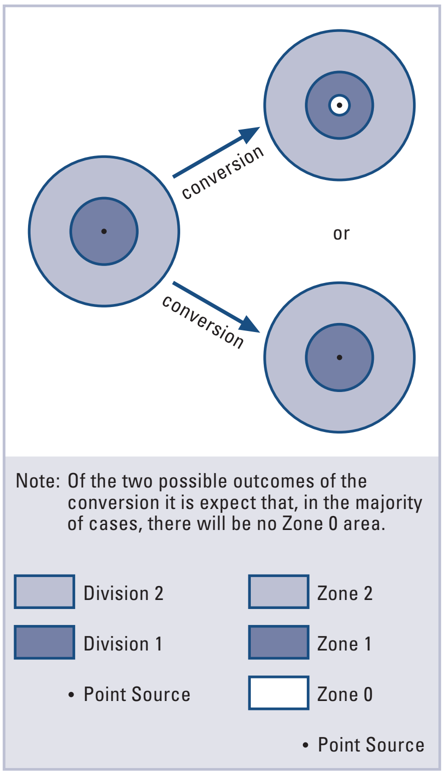

Figure 3: Conversion of Classification Area

	Gas Group			
Existing ›Division‹ classification	A	B	C	D
Conversion to ›Zone‹ Classification	IIC		IIB	IIA

Figure 2 : Conversion of Gas Groups

Why follow API RP505 instead of IEC 79-10?

Adoption of API RP 505 makes the transition to a Zone classification method fairly seamless. The classification approach and methodology is the same as with the Division method ›(i.e. use of ›Class 1‹ designation with the Zone, use of ›transition‹ Zones etc.). Additionally, this is consistent with our practice of relying primarily on North American codes and practices.

Comparison between NEC/CEC and company approach the classification and labelling

Canadian Electrical Code (CEC)

The Company approach is basically the same as that taken by the CEC. The only significant difference is that the default CEC wording allows existing ›Division‹ classified facilities to be expanded using the same classification method. The default wording of the Company standard is the opposite (i.e. to classify a facility expansion to the existing Division classification system requires special approval).

As with the CEC, the Company approach and the NEC approach are that facilities can be classified using either the ›Class/Division‹ or ›Class/Zone‹ method, different classifications are accepted in a facility, and installation techniques (conduit and cable sealing requirements, etc.) are consistent.

One key exception taken by the Company to the NEC is the marking requirements for Zone equipment, ref. NEC 505-10 (b) (2). The NEC requires all Zone certified equipment to be market with the ›AEx‹ symbol to identify that the instrument meets United States standards. The Company accepts both EEx and AEx marked equipment. Re-testing of equipment carrying the Ex type mark is not required.

Type of equipment allowed

Equipment Approval and Labelling

Equipment required in the NEC to be approved for use in a hazardous location is required by Company standards to be listed, labelled or certified by specific approval agencies. Currently, the Company standards lists three North American laboratories and eight European laboratories as being acceptable for approval of equipment used in hazardous locations. Due to changes in laboratories and agreements between laboratories we are in the process of reviewing these requirements. This does not restrict equipment purchases to equipment approved in North America and does not require equipment to be market with ›Class/Zone criteria‹ of ›AEx‹. This is explained and documented in our Company standards.

The NEC's requirement for manufacturers to re-certify, re-test and re-label equipment for different markets was considered a significant barrier. For the end user of the equipment, it adds cost, limits selection and delays the availability of the product. The Company encourages any system whose goal is to harmonize standards, achieve worldwide acceptance and universal labelling. An example is the IECEx scheme sponsored by the IEC [11].

Concerns Which Were, and Remain to be Resolved

As previously indicated, the Company standards have accepted some, but notall, IEC equipment types and installation techniques for many years. Some equipment, wiring methods and protection techniques have been accepted outright while others have been prohibited and some require special approval.

The Company uses contractors from all over the world to design and build its facilities and has very little control over the quality of their craftsmen. The Company oversees training of its tradesmen since there is no in-country certification body. Consequently there has always been, and still is, a concern over systems whose safe application is heavily dependant upon

- ›system approval‹ design concepts
- routine maintenance or
- rule interpretation by design or construction contractors.

The following are examples of some of the issues that had to be addressed during the conversion from Division to Zone classification:

- Intrinsically Safe (IS) Systems
  These systems have always been subject to a case-by-case approval by the Company engineering organization. This will remain the case for the foreseeable future. The Company is reviewing whether standard drawings can be developed to eliminate the need for case-by-case approval. Although historically, there were very few IS applications within the company, IS installations have become more common as more instrumentation suppliers are providing IS devices as their standard product offering. Therefore, this is an area that will require additional attention and continued vigilance in the future. At this time, Company standards standardize on ›ia‹ systems for both Zone 0 and Zone 1 applications. We do not believe allowing use of ›ib‹ in Zone 1 locations would result in significant savings. Standardizing on ›ia‹ makes IS applications more straightforward. Non-incentive devices are permitted in Zone 2.
- Barrier Glands
  The Company standards historically required ›barrier type‹ seals on conduit or

cable entries into enclosures that were required to be explosion proof/flameproof. This will remain the case for the time being, and we will be re-evaluating whether there is a substantial benefit in allowing non-barrier type glands. With the Company's extensive use of armoured cable, and given the advances in equipment design (use of Ex n, non-incendive instruments), there is decreasing need for explosion containment type seals, and there will be explosion containment type seals. Therefore, there will be very few installations where the ›barrier type‹ Ex d fitting is actually required to complete the explosion proof enclosure.

› Increased Safety
Prior to conversion to Zone classification the Company did not accept the increased safety protection method. After the conversion, the increased safety protection method was accepted with two exceptions:
(1) the use of junction boxes in Zone 1 areas for instrumentation cabling systems and
(2) the use of increased safety motor systems.
For junction boxes, given the constraints to adding terminations, adding cables or general modifications with increased safety junction boxes, it was decided not to accept them for instrumentation cabling systems in Zone 1 areas. This will be reviewed on a periodic basis as we obtain more experience dealing with installations in Zone 1 areas and the use of increased safety equipment.
For increased safety motor systems, given the limited number of motor applications in a Zone 1 area, and the concern over inadvertently modifying the design and nullifying the increased safety characteristics, it was decided not to accept increased safety motor installations for installation in Zone 1 locations. For Zone 2 locations, we intend to continue to accept non-certified squirrel-cage induction motors as permitted by the NEC.

› Restricted Breathing Light Fixtures
The Company believes there may be a significant cost benefit in allowing restricted breathing lighting fixtures. There are concerns with accepting a design that relies on gasket material for safety integrity especially with the high ambient in Saudi Arabia. This issue is still under evaluation.

Training

One important aspect of the decision to migrate to a Zone based classification scheme was training considerations.

Part of the justification to make the transition from Division to Zone classification was that it would be relatively straightforward. Using the guidelines of the NEC, API, RP505, and ISA 12 24 01, area classification in the Zone system should not be difficult for engineers who are familiar with classification under the Division system. As previously mentioned, one area of concern is the tendency of engineers who are accustomed to classifying under IEC 79-10 to have large Zone 1 areas surrounded by relatively small Zone 2 areas. We expect our Zone classified facilities to be similar to our Division classified facilities with relatively small Zone 1 areas surrounded by much larger Zone 2 areas. This will be addressed in our internal training.

Equipment application should not be difficult considering the guidelines published by NFPA 70 Article 505. However, the additional types of protection permitted under NEC Art. 505 will have to be thoroughly discussed in internal electrical safety training courses. Currently most electrical engineers and many maintenance technicians are familiar with the NEC and routinely use it for reference. NEC Art. 505 will be the primary reference for electrical and instrumentation installation both in the Company standards and internal training courses.

The Company currently conducts a one-week training course on electrical design in hazardous areas. One day of this course is already dedicated to IEC concepts. The course will be re-written to shift this balance. Although not developed yet, we believe that other courses specifically directed to craftsmen and electrical inspectors will also be needed.

Cost of conversion

The only cost associated with converting the Company from a Division classification system to a Zone system was the indirect man-hour cost for revising the Loss Prevention standard, which was minimal. Over time, additional man-hours will need to be spent on training related activities (e.g. revision and developing the Company course as mentioned above). Reclassification of existing facilities is being encouraged. The only cost associated with this reclassification is the manpower required to revise the classified area drawings.

Although a solely ›IEC installation‹ may not be less expensive than an ›ANSI‹ ›NEMA installation‹ [10], Company installations are expected to be less expensive simply because a wider choice of materials and installation techniques will be allowed →

and an intermix of IEC and ANSI/NEMA material and installations will be accepted.

As mentioned previously, lower cost was not the only motivator for making the conversion. Safety is a factor and having a wider choice of materials and installation techniques will allow optimisation of the design for the environmental and operating conditions (e.g. better selection of materials in highly corrosive areas). This is expected to result in lower long-term costs and higher reliability.

Conclusion

The Company moved to the Zone classification method to take advantage of a wider range of electrical /instrumentation materials, installation techniques, and eliminate safety concerns over misapplication of equipment.

The conversion was a fairly natural transition because of the Company's experience with integrating North American and IEC equipment and working with international contractors.

The advantages of moving to the Zone classification system has been appreciated for several years. Once the relevant API and NFPA documents were published, the Company standards were revised to adopt the Zone approach.

Neither method can claim superiority as both have proven track records but the Zone system is more flexible and simplifies the application of instrumentation and electrical equipment from worldwide suppliers.

The requirement of different countries to re-test, re-certify and re-label equipment (e.g. AEx vs. EEx labelling) is an un-necessary obstacle to the users. We are encouraged by the work such as the IECEx Scheme initiative [11]. Universal adoption of this scheme would be another welcome major step in achieving maximum flexibility in specifying, purchasing, and applying hazardous area equipment.

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