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ISA and IEC Standards--How Are They Impacting the Process Industry?

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Summary:

At the present time, we have two approved USA National Standards on Safety Instrumented Systems (SIS); ANSI/ISA S84.01 and ANSI/ISA S91.01. In addition, there are two international standards presently under development on this same subject; dIEC 61508 and dIEC 61511. This paper will discuss the development of each of these standards and their impact on the process industry.

ANSI/ISA S84.01 – Application of Safety Instrumented Systems for the Process Industry

The development of this standard was first started almost ten years ago when a group of individuals representing a number of manufacturers, contractors and users proposed to the Instrument Society of America (ISA) that there was an industry need for a standard on Safety Instrumented Systems. Once ISA agreed to sponsor the development of this standard, representatives from all of the process industry were invited to participate in its development. Over the course of the next few years, over 300 individuals representing about 100 companies participated in writing this standard.

Companies were invited to submit their internal standards they were using to design, install and maintain their safety instrumented systems along with any other ideas they wanted considered included in the national standard. The challenge for the committee was to harmonize these individual company standards and suggestions into a single industry standard with acceptance by everyone.

There were five sub-teams organized to develop the different parts of the standard,

1. General Framework
2. Calculations
3. Design
4. Operation and Maintenance
5. Terminology

Each of these sub-teams met many, many times while developing their individual parts of the standard. Several times a year, the full committee met together to share individual efforts and to comment on each other's work.

After all the sub-teams had completed their part of the standard, an editing committee was put together to harmonize all the parts together into one complete standard. This compiled work was then sent out to the full committee for comment and acceptance. After the full committee agreed on the contents of the standard (which in itself was a lengthy process), it was then sent out for public review and approval. This whole review and approval effort took several years to complete. The document was formally approved and issued on February 15, 1996 and accepted by ANSI as a national standard later that year.

The one part that is still incomplete is the part on calculation. The committee decided to remove this section from the standard and make it a separate Technical Report. We anticipate issuing this report later this year under the title TR 84.0.02 "Electrical (E)/Electronic (E) Programmable Electronic Systems (PES) - Safety Integrity Level Evaluation Techniques".

How does Industry View ANSI/ISA S84.01?

The process industry is a strong supporter of this standard and views it as a performance-based standard

that provides requirements and guidance in the following areas,

- Definition of terms and acronyms – For the first time, industry was able to agree on the definition of common terms and acronyms. This in itself was a major milestone since it enabled companies to have a common language to communicate among themselves to compare efforts and classifications of similar systems.
- Defined Safety Integrity Levels and performance expectations for each level.
- Defined a requirement for the development of a Safety Requirement Specification that required user companies to define both their safety functional requirements for the SIS and their safety integrity requirements.
- Defined specific design requirements for field devices, logic solver, interfaces and considerations for design practices to ensure the ability to properly maintain and test these systems.
- Defined requirements for installation, commissioning and acceptance testing.
- Defined requirements for operation, maintenance and Management of Change.
- Defined requirements that needed to be followed before a SIS was decommissioned.

Since this standard was issued in 1996, most user companies have started revising their own internal standards to reflect the requirements stated in this ANSI/ISA standard.

In addition, a number of contractors and user companies are now working together via an organization called Process Industry Practices (PIP) to develop a guideline document that gives recommendations on how to meet the requirements defined in this standard.

Industry has spent a considerable amount of money in the development of this standard by funding the cost associated with the participation of their employees to this effort. They also sponsor a number of communication sessions around the country for individuals to share their knowledge of the standard with those who are as not versed in its contents, e.g., professional society meetings, safety symposiums, etc.

ANSI/ISA S91.01 – Identification of Emergency Shutdown Systems and Controls That are Critical to Maintaining Safety in the Process Industries

The development of this standard was first started in 1994 after OSHA issued their regulation 29 CFR 1910.119. The concern a lot of users had with the regulation was a lack of a clear definition of which instrument systems were required to be managed under the regulations. Initial discussions with OSHA personnel led us to believe that due to a lack of industry definition in this area, they had no choice but to say all instrument systems were to be managed under the regulations.

In any process manufacturing facility, there are two types of instrumentation,

1. Safety Instrumented Systems (SIS) and,
2. Basic Process Control Systems (BPCS).

User companies felt very strongly that it was the Safety Instrumented Systems (SIS's) that needed to be managed under the OSHA regulations and not the Basic Process Control Systems. Their view was that the operators were continuously monitoring the BPCS and they knew immediately when there was a problem with any of these systems. Contrasting, a lot of SIS's were not routinely monitored by operators and it was these systems that required the extra design enhancements, testing requirements and stricter Management Of Change (MOC) procedures.

This standard defined that it was only the Safety Instrumented Systems that were to be maintained under the OSHA regulations and that these systems are to be identified and documented in a manner that clearly distinguishes them from the BPCS instruments.

It was felt that trying to manage all these instrument systems (BPCS and SIS) under the OSHA requirements would dilute the strong effort needed for the Safety Instrumented Systems.

How does Industry View ANSI/ISA S91.01?

In general, they view this standard as very positive and a reasonable clarification of which instrument systems are covered under the OSHA regulations.

dIEC 61508 – Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems.

This is a draft International Standard that is being developed by the International Electrotechnical Commission (IEC). The International Electrotechnical Commission is a worldwide organization for standardization comprising all national standard-writing bodies (including ANSI from the United States).

The major objective of dIEC 61508 is to facilitate the development of application sector international standards by the technical committees responsible for each of these sectors. In addition, it defines requirements that may be used by manufacturers wishing to claim their equipment is suitable for use in safety instrumented systems.

Since this international standard covers all industry sectors (e.g., medical, transportation, avionics, process industries, etc.), it is a very large standard and contains many requirements that may not be applicable to all industry sectors. In the absence of an industry specific sector international standard, it is intended that dIEC 61508 be used. (It is important to note that the USA and Canada process sector have been given an exclusion to dIEC 61508 because we already have a process industry national standard, ANSI/ISA S84.01, that will be used until the international standard is approved for the process industries.)

This standard is divided into the following seven parts,

- Part 1: General requirements;
- Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems;
- Part 3: Software requirements;
- Part 4: Definitions and abbreviations;
- Part 5: Examples of methods for the determination of safety integrity levels;
- Part 6: Guidelines on the application of parts 2 and 3;
- Part 7: Overview of techniques and measures.

The status of this standard is that Parts 1, 3, 4 and 5 are presently being translated to French and will soon be sent to all National Committees as Final Draft International Standards (FDIS) for vote. Parts 2, 6 and 7 will soon be issued to all National Committees as Committee Draft for Vote (CDV) and National Committees will be asked to comment and vote. If these three parts are accepted, it would allow them to move to the FDIS stage.

How does Industry View dIEC 61508?

In general, the process industry does not have a very favorable impression of this standard. We have found that it is hard to read and contains an excessive number of requirements, many which are vague and not crisply stated. (On the initial ballot for this standard, both USA and France voted to reject it because of these reasons.)

dIEC 61511 – Functional Safety: Safety Instrumented Systems for the Process Industry.

This standard is the process sector standard written just for the process industries using dIEC 61508 as a guideline. A committee of industry experts including those from users, manufacturing, construction, academic and regulators has been developing this standard for the past few years. We are using the same process that we used for the development of ANSI/ISA S-84.01 standard in that each participating country is invited to share their national standards with the committee for consideration for inclusion into the international standard. (The goal of the USA membership is to make dIEC61511 compatible with ANSI/ISA S84.01.)

At this time, Parts 1 and 4 are about 80 percent complete and Parts 2 and 3 about 20% complete. Long term, it is expected to become our national process sector standard.

How does Industry View dIEC 61511?

Too soon to tell. (We have shared some of the early drafts of Part 1 and we did not receive a complete rejection.)

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