

**Safety in the Process Industries SIPI 61508**

**Guiding Principles for the Implementation of IEC 61508**

**EC Project: G1MA-CT-2003-00013**

**Periodic Progress Report for period 1<sup>st</sup> June 2003 – 31<sup>st</sup> May 2004**

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## SIPI61508 – Project Report Period 2

### 1. Summary

During period two we have successfully run five SIPI workshops and achieved our target of running twelve workshops over a two-year period. The number of attendees in total is 389 averaging 32 per event against a target of 30. Of the 389 attendees 32%, the largest proportion, was drawn from the end user community, 24% from Engineering organisations and integrators and 23% from vendors. The end user presence reflects the responsibilities placed on this supply-chain cluster in implementation of the standard as a means of demonstrating ‘good practice’, complying with regulation and life cycle ownership issues.

The repository has increased from 70 to 250 entries and we expect to have reached 320+ by the end of the project. Articles provided are truly international and not limited to European authors demonstrating that SIPI has achieved international recognition.

Work commenced on enhanced functionality to the web-site (the ‘Implementers Guide’) verification of contents and mapping to life cycle phases.

Discussions with TLG members resulted in the successful launch of a number of local SIPI Groups.

### 2. Methods of working

The principle method used by the project to debate the issues and seek resolution continues to be the two-day workshop. This generic workshop programme has now been implemented on ten occasions.

The other key project attribute is the project questionnaire, again generic in structure and content, designed to be completed by the organisation/individual prior to attendance at each event, to document the issues faced by the organisation in implementing the standard, industry pressures, drivers and blockers. This information, confidential to the project partners is analysed by the partners and used to summarise the position within the particular country and identify commonality and divergence across countries. Completion of the questionnaire has been variable, in the Accession States as we expected the response was low, reflecting the lack of awareness in the standard. The other surprise was the low response within France possibly due to the late issue and concerns around confidentiality. In contrast Italy provided in excess of 60 responses, due to the efforts of the TLG members, hosting of the questionnaire on other web sites and providing a facility for completion in Italian with local translation to English.

We have succeeded at each event, in asking delegates to identify their top five issues in respect of the standard. These issues together with the questionnaire data are then analysed by the partners to cluster under common themes and provide summary information for all delegates. Appendix 1 provides an example of the summary from the workshops. To-date we have gathered in excess of 1200 individual ‘hot topic

issues' around the implementation of IEC 61508 and clustered these into common areas for analysis and feedback to all participants at the workshops. Appendices 1 & 2 provide an overview of this analysis.

Compilation of workshop material, analysis of data and development of the web site has as expected consumed considerably more effort during period two.

Liaison with attendees, safety experts, targeted contributors of material, local TLG members and others within the safety community has significantly increased during the period. However this effort has been rewarded by the increased number of entries in the repository, the quality and relevance of their technical content and launch of local SIPI groups.

The contributions to the repository have increased four fold, due to follow-up from SIPI workshops, increased awareness of the SIPI project, individual follow-up by project partners, attendance at other safety events and the activities of local SIPI Groups.

### **3. Finland workshop**

Our second year commenced with our eighth workshop held in Tampere, Finland 10<sup>th</sup> & 11<sup>th</sup> June, hosted by two TLG members, ASAF the Finnish Automation Society and Kemira a major chemical company. The event attracted 29 delegates enabling four breakout groups to be convened. Discussions within breakout groups were conducted in Finnish with workshop notes and feedback sessions in English.

Finland like Poland is a country urgently seeking technical resource and financial support for translation of all seven parts of the standard.

We secured a 50% hit rate for completed questionnaires and 60% completion of the individual top five issues in line with previous workshops.

Leena Ahonen a Senior Inspector of TUKES, the Safety Technology Authority in Finland delivered the first keynote speech 'Surveillance of dangerous chemicals Processes – automation a part of safety'. TUKES have developed a set of key aspects/areas they expect operators address in implementing safety systems (Design features, design process and operation) and plan to provide further guidance for these aspects in the next two years.

Tapio Nordbo (Enprima Oy, Finland) delivered a presentation on the use of the standard within the fossil fuels sector.

During day 2 Olli Venta from VTT Industrial Systems a research organization focused on the issues concerning software reliability and dependability.

The main issues regarding implementation centered on reliability data, proof testing, competence, life-cycle responsibilities and compliance.

Under the auspices of ASAF, whose management board was all present at the workshop, an action plan will be developed and agreed, possibly establishing a 61508 technical group within ASAF, to encourage the continuation of SIPI within Finland

#### 4. France workshop

Our SIPI French workshop hosted by TLG members INERIS and Bureau Veritas was held in Paris 17<sup>th</sup> September. During the planning exercise the TLG members considered that a one-day workshop, albeit a 'full day' would meet the requirements of French industry. The SIPI workshop structure and format was a first within France and therefore to a great extent the event was seen as a pilot. Our initial expectations were based on 30 attendees, a number which we all felt reflected the status of 61508/61511 within France; that is growing awareness of the standard but some reluctance to implement. A perception rightly or wrongly reached partly as a result of the French standards committee's negative vote.

However, on the day attendance exceeded 50 delegates and combined with five presentations and 5 breakout groups resulted in an extremely intensive day for delegates and project partners alike. In hindsight the TLG accepted that due to the popularity of the event a two-day workshop would have been more appropriate. It was also clear from the presentations and discussions that the French process industry is taking implementation of the standard seriously. In particular in the global dimension many French companies have to comply with the standard in order to win and secure business. There is a growing business in assessment of safety management systems and safety components. Many French organisations are involved in EC R&D projects.

We secured a speaker from the French regularity authorities, Bruno Cahn, who addressed the safety issues within France, the tasks the regulator faced in respect of Seveso II and how they seek to undertake site surveillance and safety report reviews. They have developed a methodology and scheme outlining how to implement the standard into the industry and have a number of supporting documents covering Methodology of risk and Guideline and analysis of risk. Bruno commented that there is a big gap between the theory and practical aspects of risk reduction and tolerability.

Our TLG members INERIS and Bureau Veritas each provided two technical speakers. The Bureau Veritas contributions covering an overview of the standard and 'A Practical Implementation of IEC 61508 within the Power Generation Industry: Turbine Over-Speed Protection and Functional Safety'. The INERIS contributions covered their core expertise in research and development, the ARAMIS EC project and analysis of safety IR barrier.

Many of the issues discussed during the breakout groups concerned the relationship of the standards to French law, interpretation of the standard and within the technical domain SIL determination, third party certification and reliability data (accuracy and sources).

Whilst we did not receive any completed questionnaires we did manage to secure 36 completed 'five-point issues', which provided a representative sample for analysis and subsequent comparison across workshops.

## 5. Italy workshop

The tenth workshop was held in Stresa, Italy during October 2003. The workshop hosted by TLG member Inprotech was attended by sixty safety practitioners drawn from a wide range of process industry organizations within Italy. This was a record attendance for a SIPI event. These organizations spanned the complete supply chain including major multi-national petrochemical companies, manufacturers of safety systems and also research and development organisations. We also received a record number of questionnaires, in excess of seventy. This was mainly due to the support of the Safety User Group who provided the questionnaire in Italian on their web site, also a translation service in addition to point-to-point contact with attendees.

The significant number of attendees ensured that our breakout groups had strong representation from across the supply chain. We were also fortunate to have four keynote presentations during the two-day workshop in addition to representatives from the Italian standards organisations. Regrettably we could not secure attendance from the Italian regulatory authorities. The attendees expressed the view that the regulatory authorities were not conversant with the standard and therefore preferred not to attend such an open event where industry had such a strong presence.

During the first day, Dr P Fanelli, a safety specialist from Invensys delivered a keynote speech 'IEC 61508 & IEC 61511 Safety Life Cycle Practical Application: A Project Documentation List for a typical CPI Project'. The presentation highlighted the importance of the life cycle model as a basis for determining deliverables, responsibilities and resources. He also commented that when talking about certification, it is better to talk about compliance with the standard and there is considerable confusion over so called SIL rated components.

Due to the significant interest within Italy demonstrated by the number of attendees we secured a second keynote speaker on day 1, Giovanni Picciolo, Polimeri Europa – "How safe is enough an existing SIS? A critical review of the IEC 61511 – Application on a case study" Picciolo's work involved a critical review of an existing interlock system on a petrochemical plant unit, based on a classical risk (reliability) assessment approach. It included a comparison to some basic clauses of both EN CENELEC 61508 (SIL's, Safe failure fraction) and IEC 61511 (minimum hardware fault tolerance) demonstrated effectiveness to the frequency acceptability criteria (Company and Public Authority).

Day 2 commenced with a short presentation by Didier Turcinovic describing the Safety User Group – a global safety community with close links to SIPI..

Dr. Sandro Bologna, Research Director, ENEA, provided a presentation covering "Common Issues on the adoption of IEC 61508 & IEC61511" His key messages focused on issues around certification of components, responsibility, ownership and provision of adequate data for determining SIL. Breakout groups during the second

day concentrated on solutions to the implementation issues from the previous day, practical experiences and useful reference material.

Finally, to close off the successful event, Fabrizio Gambetti from Snamprogetti provided attendees with feedback from his experiences on undertaking Risk Assessments. He commented that IEC61511 and its proven-in-use use requirements, when introduced would only create more problems for the safety engineer.

## **6. Czech Republic workshop**

During March the project held the first workshop within an EU Accession State, in Prague, Czech Republic. The workshop hosted by project Technical Liaison Group (TLG) members D-Ex and AZD was attended by thirty-eight safety practitioners from the Czech Republic and Slovakia, drawn from a wide range of process industry organizations in addition to representatives from the transportation sector. A representative from the regulatory authorities was not present. Delegates expressed concerns that the regulatory bodies were not prepared for issues arising and implementation of the standard. Translation was on-going and proving difficult due to the technical nature of the standard. The industry is hampered by lack of training in the standard and practical application. It was accepted that in the short term external (to Czech and Slovakia) resource and expertise would be required. There is a growing Western influence within the Czech Republic and Slovakia by some Western process licensors. It was also notable that none of the attendees had obtained a copy of IEC 61511.

The focus of the first day was a series of keynote presentations on the features of IEC 61508 and IEC 61511 delivered by Stuart Nunns and also the project's tried and tested breakout groups.

Five breakout groups focused during the first day on debating and sharing each group members top five issues with respect to implementation of IEC 61508 and through consensus building describing the groups top five issues. Group feedback sessions provided the opportunity for all delegates to challenge and debate these issues. Discussions revolved around the national regulatory bodies, their role and mandate in respect to industry compliance with IEC 61508. Also the impact membership of the EU would have if any on implementation of the standard and the opening of markets. At a technical level the main issues revolve around SIL Determination, impact of the standard when retrofitting plant and modifying legacy systems and sources of reliability data.

In keeping with previous workshops, delegates completed a project questionnaire prior to attendance. The key findings being that the standard is currently seen as manufacturer driven, there is a significant cost to implement and a lack of knowledge due to absence of technology transfer initiatives within the countries.

The workshop welcomed its keynote speaker Jelemenský Ludovít from the Department of Chemical and Biochemical Engineering, Faculty of Chemical and Food Technology, STU Bratislava, Slovakia whose topic 'Reliable Risk Analysis of Chemical Industry' provided a valuable insight into regulations (Seveso II), interpretation into national law within Czech Republic and Slovakia, the uncertainties

with risk analysis, hazard and risk assessment techniques and methods, data requirements and a practical example relating to an Ammonia storage pressurized sphere tank.

## 7. Hungary Group

Our final SIPI workshop was held in Budapest during April, hosted by TLG member Bareng. It attracted fourteen attendees from petrochemical refineries, safety system manufacturers and integrators and representatives from a pharma company and local universities. A representative from the Hungarian Technical Authority (regulator) had planned to attend but unfortunately had to cancel at the last minute.

George Baraditz of Bareng provided the keynote presentation on experiences of applying IEC 61508 in the MOL refinery and many of the 'hidden issues' in implementation. This had been a learning curve for all concerned, from engineering contractor, vendor and end user. The key message was to identify roles and responsibilities, deliverables and use of appropriate methods and tools. In addition it was imperative to recognize that aside from the technical features of the standards companies must address 'safety culture'.

Soft –Computing based Qualitative Method for Determination of SILs, was presented by Dr. Istvan Ajtonyi from the University of Miskole. After discussing the fundamental differences in approach to qualitative and quantitative methods, Dr Ajtonyi explained in more detail risk graphs and 'Thoms' theory. In conclusion he expressed concerns on the lack of resource to translate the standard.

We were fortunate in securing a third presentation "Experiences in developing communication reliability management in Hungary" by George Baraditz Junior of CONTRORG. This covered implementation of safety communication networks on a recent project at the MOL refinery.

Whilst no questionnaires were completed in advance of the event, it was decided to have an open discussion on the points raised within the questionnaire. Standards awareness within Hungary is driven by the system manufactures. The absence of a Hungarian version is significantly hindering awareness and implementation. The oil and gas refinery sector is taking the lead in implementation, notably MOL, but they have to rely on external expertise. With the impending membership of the European Community organisations are developing strategies and compliance programs for EU Directives.

## 8. Future events & activities

During the period we continued to analyse and cluster the data received both during and between the events. In particular the questionnaires and 'top five' issues. The time spent analysing this increases for each event as we consolidate the data from all previous events. However our method and approaches to data capture and analysis are sufficiently tried and tested that the clustering is representative of the issues within each member state and enables us to undertake analysis across countries and the EU. Within this period the number of contributions to the repository has risen from 70 to

250 and work has commenced in reviewing these to identify key topics/areas and map the article(s) to phase(s) of the 61508 lifecycle. This often involves translation. In addition individual discussions have and will continue with industry experts to scope and develop articles and technical material that seeks to address those 'hot topics.' This is particularly the case for SIL Determination and reliability data issues.

Additional functionality has been specified for the web site. This implementation includes a new 'front-end' providing graphical features – European map with active icons to all relevant workshop material – IEC 61508 life cycle phase model with active icons to related repository articles. Other features being developed include enhanced search functionality, entries for TLG members, training material and news section.

Mapping of repository contents to phase(s) of the IEC 61508 lifecycle will be completed during period three along with the implementation of additional functionality of the web site and verification and testing of the site and contents.

As a result of feedback from SIPI attendees and TLG members a SIPI TLG Round Table event is planned during June hosted by the EC in Brussels. This event will provide the opportunity for all TLG members to meet to debate the broader issues: What is acceptable industry practice in the area of standards and compliance with regulation? What has changed since SIPI was formed?

Have we competent personnel to support our investment in modern technologies, now and in the future and where are they?

Are we minimising the cost of ownership and maximising the benefits of our safety related systems?

Have we a cohesive supply chain?

what should be done to continue and expand the SIPI community post July 2004, SIPI exploitation activities.

Approaches will be made to a number of organisations to open discussions concerning the exploitation of project results.

## **9. Local SIPI Groups**

Over the past twelve months the project has run a further five workshops and achieved its target of running twelve workshops over a two year period. During this second period the project coordinator has had discussions and meetings with a number of TLG members who desired to spawn local SIPI Groups. In particular ASAF and Kemira in Finland; BIRA in Belgium; Safety User Group and Emerson in Italy; the University of Gdansk within Poland; Moore Industries in UK and the Danish Functional Safety Forum. As a result of these meetings and activities within the countries SIPI has successfully launched local user communities with an active programme of events and growing membership. Many of the local SIPI Groups have developed their programmes based on the 'hot topics' identified from their country

specific SIPI workshop. The new EU member states, Poland, Czech Republic and Hungary are exploring mechanisms with the EU Framework VI R&D programme.

## 10. Conclusions

SIPI has successfully run twelve events around Europe and attracted in excess of 380 delegates. The community extends beyond the delegates to an audience of several thousand safety practitioners around the world. The repository has increased four fold and considerable effort has been expended in enhancing the web site, verifying and mapping the repository contents to IEC 61508. During this period the impact of IEC 61511 is increasingly apparent, particularly within the mature countries (UK, Benelux, France, Italy) and this is reflected in the number of references within technical articles in the repository. In addition an increasing number of individuals have been approached and encouraged to develop articles to address specific hot topics. However their time is at a premium and it is often difficult for them to balance conflicting priorities.

Finally, a number of local SIPI Groups have been spawned.

The project plans a TLG Round Table forum in Brussels during June.

## Appendix 1 Review of Top-5 Issues

### Review of Top-5 Issues

Issue
Lack of understanding/knowledge
Ownership / Responsibility
Quality/Content of 61508
Lack of resources / Skills
Management
Application of / Migration to 61508
Cost / Time
Documentation
Design methodologies / Techniques
Operational/Maintenance Issues
Tools / Guidelines
Competence
Regulation
Lack of reliable maintenance data
Availability of Equipment



Appendix 2 Comparison of Issues by Country

### Comparison of Issues by Country

