“Harmonizing standardization on Data Integration in the life cycle of the Process and Power plants”

Computer Aided Engineering, the Operations & Maintenance Support and the need for harmonization of the Data Standardization in the life cycle of the Process and Power plant

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1 Things I am involved in (Process Automation focus).

USPI- STEP I&C group / ISO 15926 I&C group
EPISTLE STEP I&C peer group, STEPlib
Orchid group (libraries integration)

NAMUR AK 1.3 / VDI-VDE GMA 6.12, Eng tools
ISA SP20 committee on instrument datasheets
IEC SC 65 E WG 1 Classification and documentation on instrumentation.
NAMUR NE 100 / ISA / PROLIST. W.G.,
IEC SC 65 E WG 2 Product properties and Classification on instrumentation.
IEC TC 65 WG 12 P&I diagrams, PI&D tools and PCE-CAE tools.

IEC TC 65 WG 12 Function blocks (General + IEC 61131-3)
IEC SC 65 E WG 7 Function blocks (Fieldbus)

WIB WG field bus. (EDDL and FDT/DTM)
Intergraph Smart Plant Instrumentation Group
2.1 Analysis of the world around us.

Some plant owners have Data Centric tools approach higher on the agenda than others and have done a significant number of projects for their Grass root as Brown field plants. Also we see the problem with compliancy for Grass root as well Brown field sites fast coming up and not always well addressed at the moment.

EPC contractors are using integrated toolsets themselves, but not they are not connected with vendors, and at the end the O O gets piles of unorganized information on CD/DVD or Paper. Document management is hardly and Data management not possible.
2.2 Business drivers for Owner Operators and Partners

- Reduce waste of qualified engineering power, 40% of our eng. time is used re-entering data (NIST first time right principle)
- Concurrent engineering, can give real economic evaluation/optimising of alternatives
- Speed-up of the engineering process More than 30% time reduction possible (NIST)
- Hand over packages to O O, complete and correct Data transfer to O O possible
- Maintenance and operations Information to improve
- Benefits from data stored only once in one place (Compliancy)
- Manage the information in life-cycle (M.O.C.) of the process plants
- Improvement of the quality and aces of information
- Cheaper (faster, earlier, no rework, first time right)
- Integrated with work processes yet or will be.
- Needed for Business Process Maintain the information (compliance)
In the beginning for O.O.
No connections or integration of the tools exists.
Also no final goal did exist on this subject but now more awareness.

3.1 General considerations and improvements we need
3.2 Vision (All blocks/loose ends integrated in one virtual syst.)

ISO 15926, STEP or alike BASED VIRTUAL DATAWAREHOUSE neutral data storage, exchange organization, status and revision control, data ownership regulation

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3.3.1 What kind of blocks do we have to connect (tooling)
3.3.2 Information and information lines (to connect, tooling)

- Aspen Zyqad
- Intelligent P&ID
- FL&CD tool, LOGSIM
- DCS and PLC
- ERP SAP PM maintenance tool
- Data lines
- Adapter Translator/Interface or a Native tool

And many more

DWH

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3.4 Tool usage during the life cycle (Seq. of Work process)

Simulation tools flow sheeting and dynamic simulation
- e.g. Aspen/Zycad

Intelligent P&ID tool
- e.g. Smart Plant P&ID

Functional diagramming tools
- e.g. FL&CD tool
  - Vendor neutral

System Engin. / congfig. tool
- Vendor specific

Hardware Engineering tool
- Support tool
  - e.g. Smart Plant Instrumentation
  - e.g. INtools

Maintenance
- e.g. Smart Plant Instrumentation
  - e.g. INtools

Point of time (beginning of the Plant Life Cycle)
• **3.5.1 The use of STEP, ISO 15926 and Gellish for engineers**
The complicated matter of data models should not be a thing that the engineers should deal with in their day-to-day work. Therefore a data template technique has been developed.

• **3.5.2 The STEP, ISO 15926 and Gellish infrastructure**
A blueprint for a STEP infrastructure around the concept of data warehousing is made in the STEP community in order to give a roadmap how vendors, contractors and plant owners (owner operators) can benefit the most from the possibilities for data sharing, exchange, storage and retrieval. Within the context of this document it will not be discussed.

• **3.5.3 ISO 15926 Oil and Gas**
ISO 15926 consists of several parts:
The ISO 15926-2 defines a data model that is basically the same as AP221. The ISO 15926-2 standard was given some preference by people in the process industries above AP221 standard, although AP221 conforms to the rules of the ISO-STEP family of standards, whereas ISO 15926-2 does not. The dictionary part ISO-TS 15926-4 is intended to be a common dictionary for both AP221 and ISO 15926-2. That dictionary is a subset of the Gellish Dictionary (STEPlib). It is intended that the additional material available in STEPlib will be introduced in ISO-TS 15926-4 at a later stage. ISO 15926-7 is under development and is intended as an implementation platform for integration, sharing, exchanging, and hand-over of lifetime information, applying the Semantic Web (with languages RDF, RDFS, OWL, SPARQL, SOAP, en XSLT).

• **3.5.4 Gellish English (not an ISO standard yet)**
The Gellish English standard is an Open Source language that is a further development of the concepts in AP221 and ISO 15926-2. It uses STEPlib as the Gellish dictionary and uses a standard Gellish Table to store data. It is easier to implement Gellish than to implement AP221 or ISO 15926-2, it is extensible and it has a more powerful expression capability.

• **3.5.5 CAE x (IEC PAS 62424)**
This standard IEC PAS 62424 specifies how process control engineering requests are represented in a P&ID also defines the exchange of process control engineering request relevant data between a process control engineering tool and a P&I tool by means of a data transfer language (called CAEX, XML file with neutral data format). These provisions apply to the export/import applications of such tools. It is at the moment intended for hardware engineering and thus not includes the control architecture or functional engineering and the download to the different process control systems as DCS, PLC and field equipment. The extension with modules for further applications is possible.
4.1 The work process design control architecture by hand

- Tag numbers
  - By hand
- Tag numbers ranges, settings etc.
  - Data base
- Manual rework
  - For PCS import
- PCS/ SIS PLC and Instrument configuration tool / Engineerings tool
- Conventions, Generics
- Visual architecture
  - Transfer, by hand.
- Narratives with or without sketches
- Control/safety architecture definition
- I&C CAE Hardware Engineering Data base eg INtools

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4.2 The same work process Automated Automation

- **Tagnumber**
  - By hand or Automatic

- **I&C CAE tool for Hardware Engineering**
  - Data base

- **FL&CD tool**
  - Control architecture

- **Intelligent P&ID Info**
  - CAEX based transfer

- **PCS/ SIS PLC and Instrument configuration tool / Engineerings tool**

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4.3 Progress in emerging tooling Examples of automation

- Functional Control & Logic Diagram Tool (FC&LD Tool)
  - Visio
  - STEPlib
  - AP221
- Import P21 file
- Export P21 file

Template tool for:

- Siemens
- Fisher (Rosemount, Emmerson)
- Honeywell and others

- Neutral Language
  - For: Vendor A, Vendor B, Vendor C, Vendor D, Vendor E

Intelligent P&ID Info

CAEX based Data transfer

PCS/ SIS PLC and Instrument configuration tool / Engineerings tool
5.1 Why Work Processes are Important (Hand to Computer)

- Work processes
- Document generation. (list, specs, drawings etc)
- CAE + Data integration do have the same sequence
6.1 Prolist, ISA instrument data sheets, IEC 65E w.g.2 initiative to use CAE with data dictionaries for Manufac., EPC and O.O.
5.1 The need for Harmonisation the Standardization.
We observed and reported to the audience that there is overlap with the work to be reported in decentral meeting from the joint VDI/VDE GMA 6.12 / NAMUR AK 1.3 workgroup “CAE-integration” This was felt the need (trigger) to write this paper.

5.1.1 NAMUR A.K’s - IEC 65 and NE 100 - ISO TC 184 SC4
Our Process Control work is also related to ISO 15926. (Process Plants including Oil and Gas facilities life-cycle data) Part 1, Part 2 with respect to the data model the associated with ISO 15926 Part 4 TS Reference Data library as is used for the limited classification structure in this standard and is also aligned to STEP.

5.1.2 ISO 13584 (PLIB) - NAMUR - IEC 65B/555/NP –ISA SP20- Prolist.
At the same time we also have to look at the IEC 61360 PLIB (ISO 13584) Parts Library standardization initiative as launched at the ISO level in 1990. Its goal was to develop a computer-interpretable representation of parts library data to enable a full digital information exchange between suppliers and users ISO 13584 is a series of International Standards for the computer-sensible representation and exchange of part library data.
7.2 Harmonisation of standards 2

5.1.3 PLIB ISO 13584 - NAMUR - IEC 65B/555/NP –ISA SP20- Prolist – IEC 61804
The latter one is also to be seen in conjunction with the work to Prolist e@class work and our work in ISA in IEC TC65Ewg2 on the Project IEC 61987-10 and 11 “Measuring Equipment Properties for Electronic Data Exchange”. (excellent programs)

5.1.4 IEC 61987-2 - ISO13584 / 10303 part 221 (STEP) - ISO 15926-2
Since the CAE tools for hardware engineering have to be fed with Prolist/IEC data, some coordination is needed to harmonize with the work from the joint VDI/VDE GMA 6.12 / NAMUR AK 1.3 workgroup “CAE-integration” and the subject “DIN V 44366 or IEC 62424 with respect to Engineering we see overlap with the IEC 65 committee. Also relation is to be made to ISO 15926. (Process Plants including Oil and Gas facilities life-cycle data) Part 1, Part 2 with respect to the data model the associated with ISO 15926 Part 4 TS RDL at the same time is used for STEP AP 221.

5.1.5 IEC 60617- TC 3- 61987-10 and 11 - / ISO 15926-10303 STEP- 221 ISO13584
Human readable symbols for diagrams in different classes
Physical object and there different symbols on different functional and construction drawings need to have the same definitions.
Low number of I&C specific properties defined in EPIlib or in ISO 15926-4

High number specific Properties About 1500

Many Devices defined by inheriting specialization Classification

Device enrichment

8.1 Mapping the Engineering and Product libraries

Property Enrichment

Equipment

Properties

Properties

Devices defined by properties LOP

8.1 Mapping the Engineering and Product libraries
8.2 What is to be done around DCS’es and related systems
9.1. Conclusions

• We there for need more Harmonisation of the domain Standardization and ICT and the domains
• Integration of ICT standards and product standards needed.
• It is Needed to improve in the Business Process Operate and Maintain the availability and quality of information (compliance
• We want, Reduction of waste of qualified engineering power, the Concurrent engineering, as it can give real economic evaluation/optimising of alternatives
  We need to Speed-up the engineering process
• The Hand Over Packages to OO, complete and correct Data transfer to OO is required.
• Secure so cheaper and faster design, engineering an construction and take over procedures. (Business Process Build and Modify)
• We need to improve the Management Of Change (M.O.C.) of the information in life-cycle of the process plants.
  • We have to fix the formats, type, content and size of the Hand Over Packages (Fit for Purposes)
• Owner Operators need to work more together on their secondary Business Process together with vendors, EPC contractors and System Integrators

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9.2. Conclusions

• We as Process Control department have likely 70 % of the total plant data in possession. We therefore feel most of the need for life cycle data management and are aware of the cost and need for cooperation between the owner operators and share the cost for improving the supporting work processes.

• We as members of the Automation discipline have to agree on one more or less universal work process (keeping on talking about this takes more time than harmonizing the dictionaries)

• Process Control I&C is a discipline that is highly involved in controlling the dynamic behaviour of the applicable process, from modelling of static and dynamic process behaviour the Functional Control Diagramming route. Also we see the DCS, PLC, and SIS to be connected to MES and ERP systems (the vertical integration) for the running business, new ways for describing the control of batch and continuous plant with FCD and (F) SFC is needed.

• We are deeply involved in the hardware as it is used for measurement (transmitters, switches and gauges), control solving equipment (systems as DCS, PLC and SIS) and for the actuators the control valves, motors and variable speed drives but the software is all over the place these days.
9.3. Conclusions

- We have to expand our way of working with LOP’s to other disciples (as in contractors departments), as it concerns all engineers dealing with process research up to and including the demolition.

- The ISO 15926, Prolist and STEPlib coordination on harmonization work excellent is with and in the IEC 65E WG 2 is to be continued and expanded also for other departments as part of the IEC 61360 PLIB and ISO 13584.

- The use of ISO 15926, STEPlib and Jemima should as practiced. At the moment we should find worldwide acceptance and see TC 65E w.g. 2 as an example for other work in IEC and the other disciplines.

- Harmonization between CAEx and ISO 15926 and Gellish with STEPlib is required.

- This all will work a lot better if the other disciplines are also involved, many information is transferred during the “Build a Plant” work process between the different departments and parties as suppliers, contractors, system integrators installation contractors involved.

- IT people need better to understand to need for data management and the need for a data warehouse in the lifecycle of the process plant, in fig 3 is made clear how the data streams on 3 axes is flowing and how it should integrate.