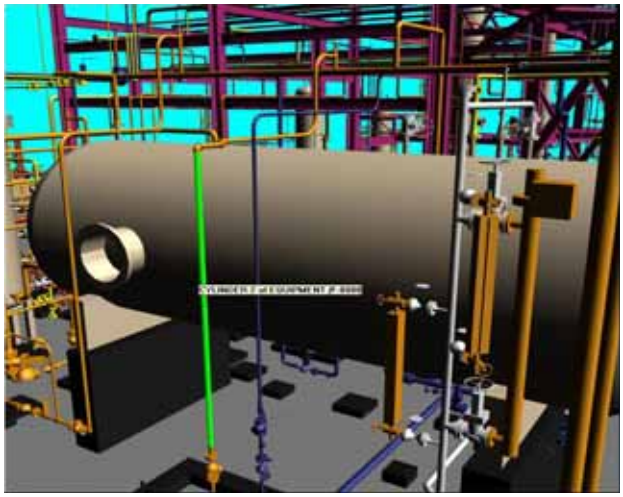
European Plant Engineering Data Conference 2007, The Hague



An 'intelligent' plant in Aveva ReviewShare[1]

Miguel Muñoz's European Plant Engineering Data Conference[2] follows on from his previous Plant Information Management (PIM) and last year's Plant Engineering Lifecycle Conference. The conference addresses software and standards relating to the management of information across the lifecycle of a plant (or major capital project) such as a refinery, offshore platform or FPSO[3]. In this report, we offer an introduction and backgrounder to the field of plant information management. It is interesting to note the parallel between the engineering community's interest in the 'digital plant,' with its document and equipment tag focus, and the 'digital oilfield's' focus on modeling and process control.

The EPEDC included presentations on major projects operated by ExxonMobil Norway and Sakhalin Energy Investment Co. (Shell). A presentation by Rosli Abdul Hamid (Malakoff Corp.) described successful use of the ISO 15926 standard in the electricity generation industry. The situation of 15926 and in particular the backing it has received from the US FIATECH body was the subject of presentations from Intergraph, Fluor Corp. and POSC/CAESAR. But most of the show covered commercial offerings from vendors including Dassault Systèmes, Intergraph, Pearson-Harper, Innotec and others. These vendors are no longer just selling applications but are increasingly involved in the information management aspects of the business. Sure, this creates tensions between the standards purists, but the technology – especially from the computer aided design community is increasingly linked in to persistent data sources of intelligent plant information and is amenable to intelligent handover.

Perhaps the only remaining roadblock to plant lifecycle data management is the relatively poor awareness from many owner operators of the possibilities of plant information management. Really, a few changes to a contract's wording up front can make a really big difference to the quality and sustainability of information available to an operator as the plant kicks into life.

Highlights

ExxonMobil's use of InnoCielo
Information Management on Sakhalin II
Fast track information management
ISO 15926 in power industry
FIATECH ADI project

[1] *Image courtesy AVEVA.*

[2] *Presentations available on http://www.european-pedc.eu/presentations.html .*

[3] *Floating production storage and offloading facility.*

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Contents

TW0715_1 Introduction and backgrounder

A major engineering construction project starts with the signature of a contract by the owner operator (OO) and the engineering prime/procurement contractor (EPC) and subsequent purchase orders with a plethora of companies making up the engineering supply chain. Multiple computer models of different scopes and granularity are created during the building of a plant prior to the delivery or handover of the finished plant to the owner operator. Many industry observers in both owner operators and vendors have noted poor information management during the construction and especially the handover phase. In another engineering discipline, according to Steve Pearson (Pearson-Harper), a jet engine has been described as an 'information degradation machine,' which takes digital data and turns it into 'scanned documents and 1,000 page plus pdfs. [...] We need to stop these silly practices from spoiling the information age.'

These problems are being addressed in several ways. Education of all stakeholders is increasingly important and now often backed up by an official information handover guide (IHOG) which ideally is included in the contract – although IHOG 'retrofits' have been reported on several major capital projects! Another significant contribution comes from the standards movement which has now converged on the ISO 15926 suite of plant data standards – which in 2007 received what appears to be enthusiastic endorsement from the US FIATECH organization. But in plant engineering as elsewhere in IM, there are tensions between the application focus (the doing tools) and the nirvana of interoperability and data completeness that a standardized approach promises. If plant data management is returning to the limelight, it is partly because the industry has settled on a pragmatic approach. The arcane data modeling approach has been replaced with a focus on documents and equipment tags (ISO 15926 Part 4). Tags are amenable for data exchange and re-use and have use beyond handover, forming a foundation for MRO[4], shutdown, emergency response and so on.

TW0715_2 Keynote address – Derek Middlemas, AVEVA

The plant industry is very information intensive, much more so than the retail or banking sectors. Organizations that succeed in managing information and reusing knowledge will gain a sustainable competitive advantage. If you consider engineering IT, here, high end 3D CAD, while not exactly a commodity, has become a 'tactical' acquisition. Over the last 10 years companies have developed a more strategic view of IT. So they may go to vendors and ask for improvements in a CAD tool for a particular task. This may not be the right answer. Software integration may have more potential.

[4] *Maintenance repair and operation.*

In construction, 25 years ago, high-end 3D CAD spending was huge compared with other industries. But today, the retail business has a fully integrated supply chain. Even a small high street shop has a computerized supply chain – while the larger stores know everything about their business instantly. Another vertical, discrete manufacturing, introduced manufacturing resource planning (MRP) about 15 years ago. Now they have ERP, PDL PLM and an integrated supply chain. This means that you can order your blue BMW and it pops out of the supply chain.

Today, the plant industry still has 'state of the art' CAD – which is cheaper and better but is basically the same. Document management, materials and engineering solutions are better but they remain point solutions. And we still spend far too long looking for data! Industry suffers from poor handover data, document-centric systems are hard to update, change is not managed and propagated and information gets spread around. Information may also be lost through resignations and retirement. A recent DARATECH conference concluded that the US needed 1500 nuclear engineers – but they are not there. The people problem is even more important for owner operators (OO).

What exactly is our problem? Why can't we use information as effectively as other verticals? It is down to the project execution strategy of owner operators and engineering contractors. There is no incentive for engineering contractors to improve when, as we often hear, '70% of our work is reimbursable.' This may seem an extreme view, but some contracts accumulate far too many spare parts because they are paid for in the capital phase. Another problem is that IT is seen as a 'necessary evil,' with vendors forcing their systems on operators and contractors. You would not see this type of behavior in BMW[5]!

There are barriers to integration. Technology can be a minefield of choice – in fact technology's potential easily exceeds industry's implementation ability (which was not the case 10-15 years ago). Technology may be used as an excuse to avoid addressing work process issues – IT can become the scapegoat. Project 'culture' focuses on the short term, people work under extreme pressure for delivery which reduces institutional learning and the ability to optimize the business. Contracting strategies are hampered by the fragmented supply chain.

Such issues can only be solved by owner operators. Unfortunately, many oils have outsourced the engineering department without changing their processes – and they 'own' the risk. A possible solution framework might involve 'dictating' what systems used (this is unlikely to work!) or specifying standards (the right approach, but easy to get around!). In reality, the only solution is a proactive IM strategy, including managing your own data. We need 'information engineers.' Such people don't exist inside owner operators. They do exist in companies like ShareCat, Pearson Harper and others. To conclude with a quote from Bill Gates, 'Today, virtually everything in business is undifferentiated commodity. So how you manage your info determines whether you win or lose[6].'

Q&A

Shell – Regarding contracting strategies with EPCs. Reimbursable contracts are the best – lump sums don't work. So how do you incentivize the optimal use of information?

It's a balance. We tend to keep writing the same contracts. Ultimately it's up to the owner operator who carries the risk.

TW0715_3 ExxonMobil Norway's use of InnoCielo Meridian – Eirik Fjelde, KTB Consultants

ExxonMobil Norway is the largest international producer and investor in Norway with 440k bopd (10% of Norwegian production) or 10% of EXOM's worldwide production. EXOM Norway operates Balder, Jotun, Ringhome and Sigyn fields. InnoCielo Meridian (ICM) is used for document management of production facilities and exploration, crossing multiple departments and external partners. ICM maintains topside and subsea technical documents for all offshore installations in the North Sea Production (NSP) region. The system offers secure, onshore and offshore access and document revision management. This allows document re-use in maintenance. Data can be exchanged with vendors, leveraging an engineering numbering system based on the NORSOK standard.

The system was built by Norwegian engineering consultants KTB (www.ktb.no). KTB is an engineering data management specialist working with BlueCielo's products[7]. Links with Maximo, Sharepoint, Documentum etc. provide lifecycle plant data management. Each facility is managed in a separate 'vault'

[5] *The supply chain analogy with the automotive industry is somewhat flawed when you consider the amount of information handed over to the 'owner operator' or driver!*

[6] *Just because BG said it doesn't make it true – he could have been trying to sell something...*

[7] *BlueCielo is the developer of InnoCielo Meridian Enterprise (ICE) content management system – more from http://www.bluecieloecm.com/products/ice/.*

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and integrated with the engineering tags database. The main area represents the 'as built' structure. Search is by tag number, a click on a tag brings up all related documents.

A maintenance project workflow begins when an external party requests a document from ICM. Files are supplied either as copies or 'as built' for changes (includes check-in, check-out and document locking) and managed according to work areas. Redline documents are available immediately onshore, obviating the need for helicopter transport of documents as was previously the case. Audit logs contain full engineering change history. The system is also used in EXOM's Operating Integrity Management System (OIMS) for procedures, manuals and revision control. EXOM believes it is critical that 'all parties work on one system.'

This was borne out in a major incident that occurred on Friday 20th August 2004. The facility had limited resources as personnel left for the weekend. A helicopter spotted 100 m2 of bubbles in the sea – a gas leak which was a serious hazard to shipping. The Norwegian authorities were contacted and they informed all nearby facilities close to StatPipe. The Jotun A responded as they saw pressure drop in the feeder connecting to StatPipe. An expansion loop on the sea bed had been exposed and caught by a trawler. Jotun A had a huge challenge – 'You get a big audience when this kind of thing happens in Norway!' Meridian allowed an onshore team to access all relevant documentation in under 30 minutes for an effective shut down. An ROV came in one week later – at a cost of $165 million to XOM. The effectiveness of the data management system was proven in this single incident.

TW0715_4 Smart Plant for operations and maintenance[8] – Peter Waywell, Intergraph UK

Technical information is now recognized as a strategic asset. A 'source of truth' for CMMS, operations, HSE, mechanical integrity – although no longer a 'single' source as it is now more process related with emphasis on data sharing across disciplines and globally. Compliance now has to be demonstrable through a governing MOC workflow across the plant, capturing domain expertise. Plant IM is used to reduce time to production and to optimize operating parameters. Intergraph's new SmartPlant for Owner Operators (SPOO) is a Business Intelligence application based on the existing SmartPlant Foundation (SPF). SPOO is a pre-configured, role-based web portal. OOs have 'fairly consistent landscape,' consisting of ERP (SAP, Maximo, Passport), DCS/Automation, safety, reliability and content management. SPF talks to all of these – and the SPOO portal sits on top. Waywell showed a video of information coming from SPF, SAP and Meridian into role-based views. The front end offers a 3D view of the plant with smart objects – select an object and see related information. Select a tag and see all occurrences – pumps highlighted in blue – check reliability information in Meridian, initiate change work order for failing pumps in SAP Netweaver.

Q&A

Is inter-vendor operability improving?

Not really. But this solution does obviate file transfer.

TW0715_5 The Trimble Connected Plant[9] – Hartmut Stadali, Trimble

Trimble's Connected Plant rolls in laser scanning data, survey, vehicle tracking from spatial imaging, to machine control (for guidance of vehicles and plant equipment such as graders).The Trimble GX Advanced 3DLS time of flight long range scanner offers 'what you see is what you scan'. The tool provides brightness/hardness information on reflectors providing information about what is scanned which can be translated into color. Modeling a pipe gantry and rework for the best as-built image you can imagine. A different approach is point cloud modeling – offering much higher resolution. Grey scale looks like a photograph. Trimble's LASERGen suite of tools are used for example to clip details out of a large point cloud for viewing[10]. These produce realistic black and white scenes for comparison of as built with original drawings in AutoCAD. Interference and clash detection is used to figure out what needs to be moved, for instance to move heavy equipment to make space for new large items. Such 'constructibility' studies are done in a large point cloud model of the plant. Significant cost benefits are claimed. But models are only as accurate as the control network, here a geo-referenced database is essential. For the ultimate plant models, georeferenced survey points are established with optical total station[11] and detail provided with differential GPS. Stadali believes it makes sense to cadastre your plant.

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[8] *Presentation available at http://www.european-pedc.eu/Presentations/Waywell%20Peter.pdf.*

[9] *Presentation available at http://www.european-pedc.eu/Presentations/Stadali%20Hartmut.pdf.*

[10] *These are visualized in 3D with Eltima's SWF&FLV toolbox which converts Flash files and video into graphic formats such as AVI, animated GIF and frame-by-frame JPEG/GIF/BMP – www.eltima.com.*

[11] *http://en.wikipedia.org/wiki/Total_station.*

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TW0715_6 Plant Lifecycle Management for EPCs and OOs[12] – Simon Roberts, Innotec

Quality and quantity of information peaks at handover then declines sharply unless integrated plant information lifecycle management (IPLCM) is implemented. Innotec Comos comprises Comos Basic, Comos MotionX and an XML database access into which a dozen or so tools can be 'plugged.' These include tools for engineering, design, shutdowns (with MS Project), MS Office, SAP, Cleopatra from Cost Engineering (NL) and Process Control DCS systems (Siemens Siematic etc.). Comos offers multiple views of the same data source. For instance a pump's attributes (motor, power source, fluids pumped ...) are encapsulated in XML. The Motion X infrastructure provides integration with third party data. At handover, a huge amount of information arrives and ages quickly – hence the need for a 'digital plant' – as close as possible to reality. One client, Aker Kvaerner has used the Comos Engineering Data Warehouse to create a global engineering system. An agreement has been reached to embed the ISO 15926/Norsok-standard into the Comos data model. Aker has a 10,000 strong Comos user group, 500 concurrent users. Comos is also a component of Petrobras' Engineering Data Warehouse.

Q&A

Will you extend the ISO 15926 data model?

Yes this may be necessary.

What's important to EPCs is metadata of change notification, data locking etc. Is this on offer?

To a degree – you need to tag data ownership. Comos has a working layer where you can take data out of the database check it back in. But unfettered access to the database is not good.

TW0715_7 IM Challenges on Sakhalin II – Chris Mitchell, AMEC

Sakhalin Energy Investment Co.[13] (SEIC) has built two giant platforms Lun-A and PA-B. AMEC provided the topside FEED[14], design, engineering and procurement. ShareCAT was also involved. Multiple facilities and a complete island were created for operations in a temperature range from -40° to +40°. The locality is on the Pacific 'ring of fire,' and exposed to sea ice loading and destructive storms. The LUN-A 22,000 tonnes topside was a world record when built – but broken by the PA-B at 28,000 tonnes. Information management scope spans engineering design and document management, document control, engineering systems PEGS, PDMS and Intools (Intergraph), AVEVA and ShareCAT. Systems have been interfaced with AMEC's corporate IT in support of the information handover guide (IHOG). IM customers and locations are spread around the world, from Calgary to Sydney, with 95 suppliers and 200 purchase orders.

This complex supply chain maps to an equally complex array of vendors, software tools databases and worflows for data capture and QC. ShareCat[15] has been deployed as the key application for supply chain coordination. The tool was first used by AMEC to gather vendor documentation. Now SEIC has adopted the tool and expanded its scope to include documents, tag data, content and SPIR[16].

The project revealed that in general, people are not aware of what information management is! At the end of the design phase, IM awareness was limited to AMEC senior management. In general, SEIC management was less aware of its benefits. An audit by Shell International (SITI) determined that a parallel IM support effort was required. This focused on improving handover understanding by both AMEC and SEIC. The audit also determined that an information loss due to poor IM would amount to about 1% of Capex – i.e. $250 million. A full time SEIC information manager was appointed in late 2004.

The AMEC team in Croydon was too small so the 3D model was shared between AMEC offices around the world. SEIC data was passed on to LiveLink daily and construction deliverables to SHI in South Korea. One problem came from the fact that documents had to be 'wet signed' on hard copy for the Russian authorities. This proved hard to achieve with the project's 80,000 hard copies.

Initially there was little awareness of IHOG needs across the supply chain and vendors omitted data requirements resulting in a 'mismatch' in delivery. Getting vendors to deliver tag data and key documents was not easy. A 10% retention was 'too little and too late'. For data management to work it was necessary to avoid completions, commissioning and maintenance management each building their own database – even though all have immediate needs for data. The project generated 192,000 tag numbers and 1.5 million data attributes.

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[12] *Presentation available on http://www.european-pedc.eu/Presentations/Roberts%20Simon.pdf.*

[13] *A Gazprom, Shell, Mitsu, Mitsubishi joint venture - http://www.sakhalinenergy.com/en/.*

[14] *Front end engineering design.*

[15] *http://www.sharecat.com/WinWinWin.html.*

[16] *Spare Parts List and Interchangeability Record.*

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IHOG was not recognized by SEIC at the outset and was 'retrofitted' into the contract. Data was aligned with Shell's E-SPIR spare parts database. An SEIC peer review recommended information management KPI[17]s (in the middle of the project). Lessons learned: central tag management proved effective as did detailed instructions across the supply chain and specs for progressive handover. Culture change management was required to ensure engineering understands both information management and handover. A progressive purchase order close-out was achieved with support for vendors with delivery of documents and data. Overall, SEIC describes Sakhalin II as an information management success on a world class project. These learnings have been rolled-into Shell's current Electronic Information Sharing Design and Engineering Practice.

Q&A

Is this the first project with these tools?

Yes for ShareCAT, not for PDMS.

Was there a detailed spec for the IHOG information management system?

No. The IHOG was designed by SEIC during the project. Requirements were unclear initially and were sorted out en route, eliminating the 'nice to haves'.

TW0715_8 PLM for energy and process – Rolf Gibbels, Dassault Systèmes

Dassault Systèmes formed its Plant Lifecycle Management partnership with IBM in 1981 and this now serves 11 verticals and includes a relationship with IBM's Maximo MRO operation. Dassault brands include SolidWorks, Catia, Simulia, Delmia Enovia and 3DVia and the new CIMAGE acquisition. A click through from CATIA pulls up information from the Enovia parts database. PLM Plant defines owner operator data ownership throughout a project – linking engineering, construction and maintenance from day one.

Gibbels offered a PLM complexity comparison with other industries: an Audi weighs 2 tonnes for some 10,000 parts, a Boeing 787 weighs 240 tonnes[18] for 1 million parts and a modern FPSO weighs some 10 thousand tones and has maybe 135,000 parts. Until recently, plant process and petrochemicals have lagged in PLM – but today, 'the time is right.' A spectacular example of a modern construction facility is Yantai Raffles' 'Taisun' 20,000 tonnes lift gantry crane – the largest in the world. Taisun is 105 meters high above a deep dry dock[19] that allows all construction to be carried out at ground level. Dassault clients include ExxonMobil, BP, Shell, Petrobras. More from www.3ds.com.

Q&A

Can you confirm the rumor that we are the worst industry for collaboration?

Yes – there are too many silos.

Paul van Exel – There are also many players playing small roles in building plants. Their information is particularly hard to re-use.

TW0715_9 Discussion

Why is it proving so hard for the process industry to get where the automotive industry is today?

Gibbels – One problem has been the move to non-scalable Microsoft Windows platforms, this tends to make every project a 'one off'. But this should not be an excuse any more. The technology is there now, time is ripe for a change.

Middlemass – Product lifecycle management (PLM) has been used in manufacturing since the 1990s – following design through manufacturing. But in construction, work on a plant often starts before design is finished – makes the concepts a lot harder to apply. Some PLM exists in CAD systems – but not the unified data model.

Ritche – In manufacturing much information handover is inside a company – makes things easier.

Steve Pearson – Rolls Royce don't re-engineer every time they get an order. Huge amount of our projects are unchanged. We need to build on this and follow the automobile industry. Abandon the 'not invented here' mentality.

Ritche – I would question the importance of project size and complexity; do these really make a difference?

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[17] *Key performance indicators.*

[18] *Visit http://www.pbs.org/newshour/bb/science/jan-june07/airplane_01-09.html for video of Boeing 787 design and 'virtual' roll out.*

[19] *See the animations of the 20,000 tonnes 'Taisun' gantry crane on http://www.yantai-raffles.com.*

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What has been the real impact of standards?

Koning – One problem is that in our plants, there are no mechanisms for managing information. All we do is come up with new standards. When we build a new plant, there is no information standard governing how much is put into the data warehouse. Shipbuilders get certificates – showing that everything has been checked. In the process industry this is not always the case.

So that would make compliance the driver.

Pearson – We recently compiled both oil company and international standards and have now documented where and what is required. We now have an audit trail showing what is needed, why and in what context. Communication with the DCS[20] community would be greatly helped by electronic communications. Today things are still done by faxes and pdfs! Our job is to make suppliers part with their information and reduce their work. In return we give them back ISO 15926-compliant information. This speeds up the workflow and suppliers get paid more quickly. For smaller suppliers, we show that they can benefit from better use of IT – how many components they have or will sell. It's the information that lets the OEMs do this.

Koning – Speaking as an owner operator, we should be aiming for simplicity. Standardization is better than paying suppliers for re-doing the same thing.

What should be the role of owner operators. Why isn't all this done already?

Many OOs have organizational problems.

But it's your plant. Most OOs have no interest in their engineering data!

They should have. We once identified a corrosion problem in our pipework. Taking the pipes out was out easy. But it cost millions to measure and place the new pipes. This is a good argument in favor of a standardized plant information model.

We need to get the business side of the OOs more interested. Connect plant wide IM with production – rather than maintenance. Sell these kinds of benefits to management.

Pearson – We advocate simplicity – with perhaps five key attributes in the model. OOs may say they want 300 – but I am trying to sell common sense.

All engineering is cost engineering.

There is a trend from engineering 'tradition' to operations. Most are happy with this which brings more interfaces with ERP, business systems. These are beautiful tools but data inside them is in proprietary formats. To what extent can you modify data in these 'doing' tools (proprietary)?

This could be solved with a data warehouse – the 'mother of all' databases – around which tools, adaptors, workflows can operate.

Pearson – We are happy with InTools. Put data in once. But don't ditch the 'doing tools,' even though OOs like to do this!

Reuse engineering data in the ERP system. Unfortunately too often we begin with 'data centric' information – then throw it away and go to a pdf!

TW0715_10 ISO 15926 and the 'tyranny of numbers' – Dalip Sud, Shell

ISO 15926 has 7 parts. So if you say you are 'compliant,' you need to make it clear which part you are compliant with! Parts 1 and 5 are administrative internal documents. Part 2 is the data model (this was published first). Part 3 is geometry – which is being used. Part 4, published in October 2007 is the 'parts list.' Part 7 describes document templates – or more accurately a methodology for template development – not the templates themselves. This is currently in development. So today only parts 2, 3 and 4 exist. In the field of interoperability and data exchange vendors are faced with the 'tyranny of numbers.' OOs have around 1,000 different document types and 500-1,000 equipment classes with up to 10,000 distinct properties. A large LNG facility or offshore platform may have 100,000 tags – from 75-200,000 individual items of equipment (each with a couple of hundred properties and from 1 to 50 spare parts with more properties!) Multiply these numbers and you get an idea of what 'machine to machine interoperability' entails. It is a marvel that a number of software vendors have been attempting to solve this problem over the last ten years. Think of the sheer magnitude of processing power required to manage all this. One query could require huge resources.

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[20] *Distributed control systems - http://en.wikipedia.org/wiki/Distributed_Control_System.*

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TW0715_11 Engineering productivity – Philippe Marceau, Intergraph

Intergraph is best known for its geospatial and CAD applications – but today's trend is a move from plant design to asset management. 'Next generation' plant solutions are moving away from the CAD-centric view of design. The future is here now – with one command, 'move up platform,' a whole FPSO deck can move up – everything is catered for. But the future of engineering depends on information management and standards. Intergraph is to spend $45 million on R&D in 2008. Part will go on integrating manufacturing intelligence with CAD to reduce design time and create 'very accurate bid documents.' SmartPlant i-Sketch links piping isometrics to 3D modeling and a materials management solution from Enning GmbH. Intergraph studies have shown that poor interoperability costs 3% of CAPEX in plant construction and operations. 'Obsolete software architecture' (Microsoft Windows) limits progress. Marceau suggests investing in 'more up to date core software technology.' Industry is reaching the end of this phase of cost efficiencies and needs to invest in something new. For instance 3D plant design – like SmartPlant. On the topic of standards Philippe mentioned ISO 15926, and 'very many others SAP, MS Office, etc.'

TW0715_12 XML Plant – Adrian Laud, Noumenon Consulting

Laud has been working in interoperability for 20 years. Today, ISO 15926 is not just a 'theory', or a 'future,' it is saving costs. The US National Institute of Standards and technology (NIST) estimated last year that $60 billion is lost of major capital projects due to poor interoperability[21]. Today 80 major commercial projects have used ISO15926. The schema defines an exchange file format and leverages earlier work by STEP, AP221, EPISTLE, POSC-C and STEPLIB. These have converged to ISO 15926 and the 'all important' Class Library. ISO15926 is used for intelligent model exchange using the Part 4 reference data library.

Laud's 'XMPlant' application does rule-based mapping to enable applications to work on top of ISO15926. The scope is the full engineering information model – otherwise information gets locked in the proprietary applications that created it. This can be problematic in that although companies claim to deploy common catalogs and descriptions this is not really the case. OOs need to 'own' the catalog. The first deployment of XMLPlant was on a frigate in 1996. In 2001 Noumenon put the schema into the public domain. In 2003 XMLPlant was used in Aveva's products.

Today the XMLPlant schema is aligned with the ISO reference data library (RDL). Ten vendors have deployed XMLPLant successfully on 18 projects. One key approach embedded in the tool is 'value mapping' – substring, nested mapping and pattern matching to recognize the strings that form tags. XMLPlant was used on BP's $3.3 billion Greater Plutonia FPSO, Shell's Nanhai, Vhina $3.4 billion petrochemical facility and Woodside operated facilities. Data migration projects are underway in the North Sea on Heidrun, Sleipler and Snovit.

Q&A

How did we get from the tyranny of numbers to this rosy picture? Other verticals (notably the upstream) have come unstuck when trying to use a data model at different levels of detail.

A key aspect of the RDL is that it allows for any granularity and hierarchy to be used.

TW0715_13 'Fast track' information – Steve Pearson, Pearson-Harper

'Content is king – and is an issue that systems can't solve. If you build a data warehouse without implementing content management you are wasting your time'. A jet engine has been described as an information degradation machine. Digital data becomes scanned documents and a 1,000 page pdf. Intelligence is lost and it is difficult to navigate information. We need to stop these silly practices from spoiling the information age. Since everyone is buying the same equipment, there is a great opportunity to share information between companies. Pearson-Harper (PH) brings together common equipment information. But not in too much detail! Rosemount can generate 3 billion permutations of a model number. So there is a need to simplify, stitch it all together, do it once and use it many times. For instance in spare parts information re-use. PH's PHusion library was developed in collaboration with OEMs, component manufacturers. The library now has descriptions of (*inter alia*) 45,000 fuses, 410,000 bearings and so on. PH only does major projects such as the $7.5 billion Azeri-Chirag-Guneshli (Azerbaijan) project, Nexen's Buzzard development, BP Block 31 (4 FPSOs) and Greater Plutonia. Major projects see the benefits from

[21] *Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry* - *http://www.bfrl.nist.gov/oae/publications/gcrs/04867.pdf*.

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content management. Uses include safety warnings – when equipment fails you need to know 'where have we got this kit installed?' The ISO 15926 templates are something of a chimera – PH has the templates!

EPCs still tend to work in silos and there are still major problems on big projects. EPC stuff goes into PH PHasset ('nearly similar' to ISO 15926 Part 2) and Microsoft SharePoint is used to expose the data. PHusion adds catalog information from equipment suppliers (who can connect to and update the database). Client systems, such as DMS, AVEVA, SAP, Maximo can be populated from the database. PH is now hosting all of BP's Block 21 engineering information on SharePoint.

PH has mapped its dataset to ISO 15926 as a 'charitable' contribution to industry – 'although we charge for the privilege.' PH has found that the initial 50,000 tags could be slimmed down to some 2,500 generic items. This is used on handover to keep stuff in synch. Equipment items can be monitored – for instance to ensure that everything in a hazardous area has the correct current status so that only safe area kit is deployed in a hazardous area. Previously an EPC indicated that it was receiving plant information 12 months after first oil. On another project, (with PH) information was available 12 months before first oil – so commissioning, operations all can get working with the same data much earlier. Data completeness has risen from 50% to 95% and data accuracy is up from 11% to 90%. Prior to BP's Texas city fire BP had no tag management system. They do now!

Q&A

Do you give stuff back to Part 4 – rather like the Open Source movement?

We always look to see if stuff is in the data library. We do submit stuff but unfortunately, POSC-CAESAR expects us to pay for the review process. We are an SME, there is now way we can afford this. Maybe BP can pay! But we totally agree with the movement.

When are vendors asked for this data?

The best is at bid time. We came in too late on Buzzard – the spreadsheet philosophy had already taken hold. It can be done in these circumstances but it is harder. On the other hand, some OEMs charge for this information. Rolls Royce charges $500,000 per skid for information. BP is trying to get a deal on this now it is digital and potentially re-usable information.

TW0715_14 ISO 16926 in the power industry – Rosli Abdul Hamid, Malakoff Corp. Berhad[22]

Malakoff is a Malaysian owner operator of power plants in Malaysia, Saudi Arabia, Oman, Jordan and Algeria with a total 5 GigaWatt generating capacity. Malakoff has implemented a Life Cycle Asset Information Management (LCAIM) initiative leveraging ISO 15926 in an owner operator perspective. The power industry has been slow with standards adoption. IM challenges for OOs include standards' inconsistency, plant information stored as unstructured documents, hard copies, low 'as built' data quality. Data is hard to maintain because of missing native formats of engineering schematics, especially when acquiring a 15 year old plant. LCAIM leverage IM developments – Open Source, XML, portals and standards from PCA and FIATECH. Malakoff's rationale in using standards was to achieve synergies in its activity as a large capital facility developer and operations and maintenance service provider. LCAIM can be seen as a business process reengineering initiative. IEC 61355 also ran. Malakoff started on the data model in 2005 with roll out on the Tanjung Bin power plant in 2007.

LCAIM offers a structured approach to handover from EPC to operations and maintenance (O&M) by harmonizing IM across O&M and engineering. On the business side, EPC deliverables leverage 'intelligent' engineering applications based on the 15926 data model. EPCs and key suppliers deliver structured data on handover. To avoid a 'big bang' handover, a handover workflow has been created. Files and documents from EPC and suppliers are gathered. Post handover, these are structured to ISO 15926 (into two databases as above) which supply data to O&M phase – in CMM[23] and DCS[24] systems. The LCAIM portal provides a view into the databases. Scope includes process, electrical, I&C[25] engineering applications with interaction between engineering tools and document management through a document tag. 90% of LCAIM data model is reusable across projects. Views can be generated from structured data. LCAIM reflects a shift in thinking from document to structured data management. LCAIM currently holds 220 intelligent datasheets and 2,850 class diagrams. EPCs and vendors should align on standards – such as ISO 158926. The OO is the ultimate

[22] *http://www.malakoff.com.my/.*

[23] *Computerized maintenance management.*

[24] *Distributed control systems.*

[25] *Instrumentation and control.*

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custodian of information. Competition is increasing in IWPP with sourcing from China. Information will be an issue if not properly managed. OOs with IM and QA/QC risk control will have a competitive advantage. Also ran – VGB 105 (Kraftwerks), ISO 15926-4, Documents - IEC 61355, VGB 171, Symbology - ISO 14617, IEC 60617, ISA 5.4. More from www.malakoff.com.

Q&A

Paap *– This is most interesting presentation I ever heard – it's a shame there is no time for discussion.*

TW0715_15 Pragmatic ISO 15926 – Ian Glendinning, Intergraph.

The real standardization involves standardized *usage*. This involves a large and complex set of issues which Glendinning analyzes from an information management perspective. Increasing integration creates value at the expense of increasing effort. Base level integration is achieved by managing equipment identifiers. How far do you need to go in data modeling? For the core schema (ISO 15926 Part 2), use is a 'no brainer' as is the reference data (Part 4). Part 7 extends the standard to vendor specific data. Part 7 is work in progress – but is being used as Part 7 'lite.' ISO 15926 talks were given to a packed house at the 2007 Daratech and have been rolled into the FIATECH ADI project. Finally some serious resources are being applied to 'making 15926 happen.' Intergraph's SmartPlant products support 15926.

TW0715_16 FIATECH ADI Project – Onno Paap, Fluor Corp.

The US-based not for profit FIATECH[26] organization is run by a group of owner operators, contractors, suppliers and research organizations. FIATECH's mission is to accelerate the deployment of integration and automation technology. Significant publications include the Capital Projects Roadmap[27] and the IHOG[28]. All this is a 'very grand scheme' – including intelligent, self-maintaining and self-repairing facilities. A rather 'un-American,' far-seeing vision. Interoperability is a component with lifecycle data management and information integration – leveraging scarce resources, reducing fragmentation and wasteful standards overlap and competition. Today there are 'islands' of automation in construction – engineering design, architectural design, etc. These are merging to an automated and integrated environment. This is to be achieved by selecting the most appropriate standards for the industry. FIATECH has chosen ISO 15926 – and is even collaborating with the 'enemy' Bechtel.

ISO 15926 Part 2 is a bit complex and should not be shown engineers. Part 3 describes structures for 2D/3D data. Part 4 defines terms to label or identify information – Part 4 is more than an ECCMA-style list of terms – it can also describe relationships. Part 7 describes deployment – structures for information organization and exchange.

The problem was that ISO 15926 was 15 years in development – and is not expected to complete for another five years. Companies were starting to do their own thing. So FIATECH has launched the Work in Progress project to make ISO 15926 available to industry. Deliverables include an open source integration software and 'evergreen' internet-based online library providing a single global source of reference data, core classes and object information models. Bentley and Intergraph are on board and have added their own tools and products – in Java and .NET/C# (Fluor). ADI sponsors include many OOs and vendors – but no equipment suppliers – who are still polarized on the data sheet approach and their own commercial websites.

The WIP holds as yet uncertified classes prior to ISO certification. A facade exposes RDL to legacy EPC system and allows supplier mapping. The WIP can be seen as a 'confederation' of participating facades – EPC, OO on site, at HQ, supplier catalogs and project data, EPC contractor(s) project data. A service-oriented architecture supports communication between facades. Smaller suppliers can go through umbrella organizations like Tektonisk. The W3C's Semantic Web technology underpins the WIP – which is powered by a triple store. The project also involves a lot of semantic investigation and extension of the ISO standard.

The WIP is now operational and running in Norway. James Porter, DuPont, was quoted as saying, 'There is no longer any reason to wait. In the not too distant future this [ISO 15926] will be a requirement for doing business across the process industry.' WIP enthusiasts include XMPLant, Bentley, NRX, Bechtel, Fluor, IDS, and AEX. More from www.fiatech.org. www.iso15926.org.

Q&A

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[26] *Fully Integrated and Automated Technology for the capital projects industry.*

[27] *http://www.fiatech.org/projects/roadmap/cptri.htm.*

[28] *http://www.fiatech.org/pdfs/research/CFIHGPart1.pdf.*

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Who is the ISO certifying agency?

van Exel (ISO project manager) - currently maintenance procedures exist for Part 4. Today the WIP is a private initiative. ISO changes can be proposed by anybody. But there is then the question of validation – an ISO process exists for this.

Sud – This presentation underlines the huge effort FIATECH has put into ISO 15926.

TW0715_17 Intelligent Data Sheet Project – Magne Valen-Sanstad, POSC/Caesar

The IDS[29] project is the basis for machine to machine data exchange in support of 'integrated operations' IDS has backing from Statoil, DNV, Bechtel, AVEVA, Intergraph, OLF, ShareCat, Bentley, ALCIM, IXIT and PCA[30]. The three year project has a $2.7 million budget through to 2008. The projects began by mapping engineering data sheets – but the 'generalized ISO 15926 approach' is applicable to any data set. The US-based FIATECH organization has also been involved. Earlier work on Vigdis (Saga Petroleum and Aker with ABB and Nymo) using object oriented databases were plagued with terminological difficulties. For instance there are no less than eight current definitions of mean time between failure (MTBF) – some are comparable but some differ. 'If you share this kind of information across systems, you may have trouble.' So it is necessary to get down to unique concepts and definitions and to talk to the experts. Another example is the way a bolt is described – this differs between manufacturers' drawings and engineering data sheets. Standardizing data models not is sufficient; you need a standard representation of data. Integration requires a 'neutral' description with respect to usage. Data about the same thing is held in multiple repositories over its lifecycle. Restrictions that are valid in one repository may not be valid elsewhere. So you must model 'what things are' not 'what they are used for.' Note that the lifetime of data is longer than current computer systems (hardware and applications). IDS is to enable Integrated Operations with neutral data. Real time data flows onshore create multiple integration issues. Data sheets including the NORSOK project data sheet, ISA project data sheet, SAP and P&ID[31] have all been mapped to the conceptual model (ISO 15926 Parts 2 and 4). An IDS prototype was developed to share information across ShareCat, XMPlant and a NORSOK data sheet from Hydro. Only three data fields could be shared automatically, the rest required domain mapping by experts for several different contexts/meanings. A demonstrator will be available early next year – there will probably be 100-150 templates.

TW0715_18 Panel discussion

What about keeping the standards alive – updating with new information as it becomes available?

Sud – Maintenance is an important issue and a hot topic – not just for Part 4, there is a debate going on in ISO on this general subject. The process for Part 4 has been agreed and 'rubber stamped' by ISO and a maintenance agency has been set up. TC184/SC4 is to manage this process. The current databases and spreadsheets will be available from a server. Updates are vetted on a 6 month to 1 year period. But the big issue is finance! Traditionally people pay for standards – but this library is free of charge – so who will pay?

Paap – The WIP has given us a 'lean and mean' system. Certified users can add to the RDL and additions are available immediately. If not generally required, data can be combined with in-house databases. Shared data can go to a central core library with data status 'preliminary.' Changes are gathered every few months – and go to the ISO group for 6-12 monthly update.

Pearson – We have already submitted a couple of thousand classes – where are they now[32]?

Magne – If they're not there it's because initial sets were stretching our own resources to the limits. We just got the process rolling. Some stuff was left out just to get the process running.

What is the role of the different discipline groups?

Sud – The current process that funnels everything through a few people is not sustainable. It takes too long, it doesn't involve all discipline experts and there is no money to pay them anyway! I suggested we use specialists from outside this industry – such as PROLIST[33], compressor groups, etc. Also they are members

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[29] *The project is also known as the PCA or DNV data sheet project.*

[30] *POSC/CAESAR Association – www.posccaesar.com.*

[31] *Piping and Interumentation.*

[32] *As in other standards initiatives, politics play a role. One authority suggested that the slow progress of ISO 15926 Part 4 was due to one player's attempt to 'corner the market' in parts nomenclature.*

[33] *http://www.namur.de/work-areas-af-and-project-groups-pg/project-group-6-lists-of-properties/?L=2.*

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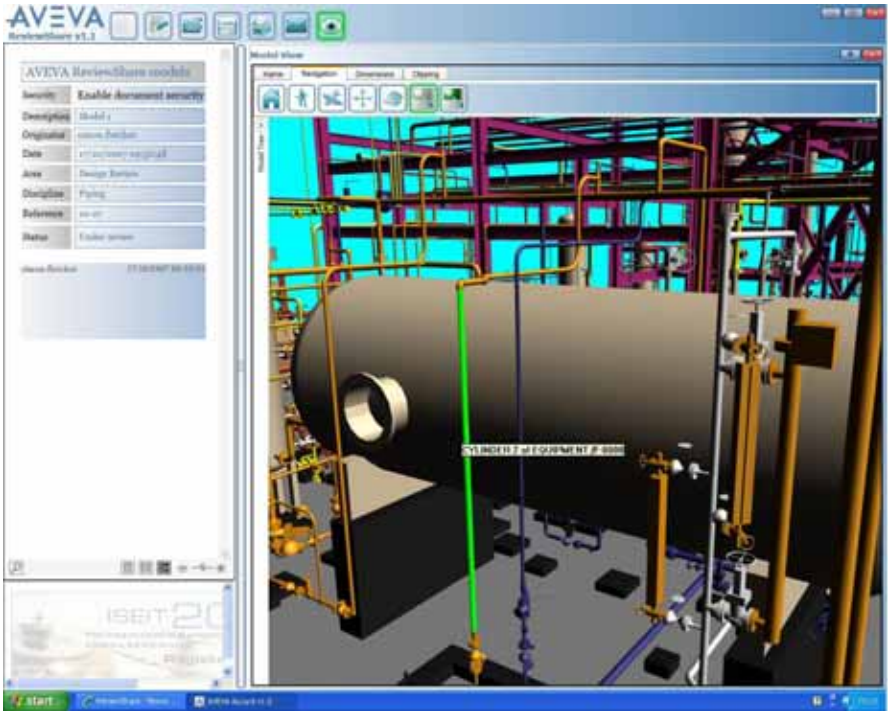
of other ISO committees. This works, we did it with the two above groups (PROLIST and compressors). It only took PROLIST 4 or 5 hours because they had already mapped to STEPLIB. The same for the compressor group – a day or so. This will mean that the current group takes a back seat.

Glendinning – The current process is already hands-off. The WIP accepts anyone with minimum expertise. Peer review is what will slow things down. Projects need a quick turn around.

Magne – We have been working with the compressor group and ISO TC67 (subsea equipment). It needs a lot of effort to get involvement.

TW0715_19 Exhibitors

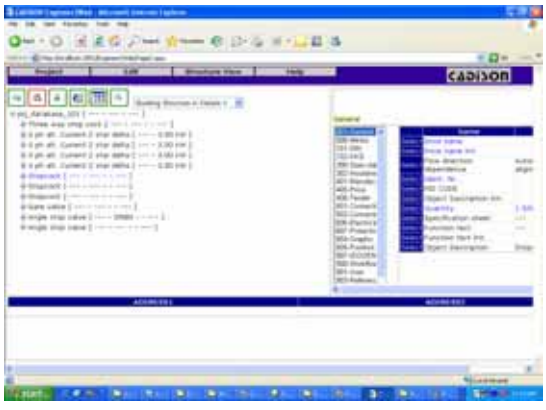
0715_19.1 Aveva – ReviewShare

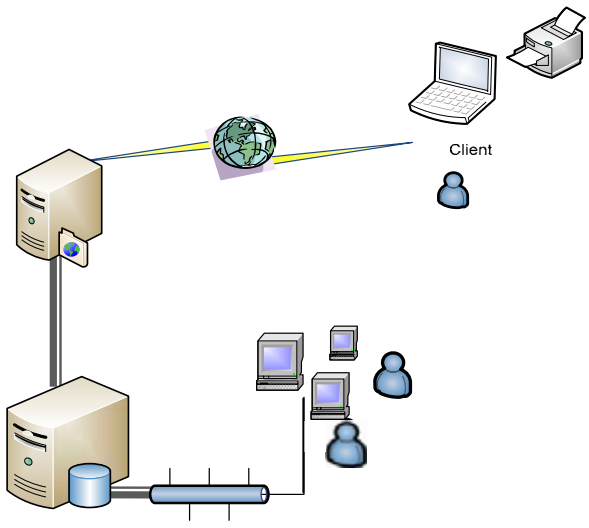


Aveva ReviewShare

Aveva ReviewShare (part of a AVEVA' 'Review application) offers 3D review, annotation, markup and collaboration on models of unlimited size. Review material can be circulated to reviewers by email from within the application, in a document that is only a fraction of the size of the 3D model being reviewed. Partners, suppliers and subcontractors can also be given access to ReviewShare, creating an extended collaborative environment. Aveva clients include Aker Kvaerner, BP, Chevron, CNOOC, ExxonMobil, SBM, Shell, Sinopec Engineering and the Wood Group. More from www.aveva.com/reviewshare.

0715_19.2 IT & Factory – Cadison





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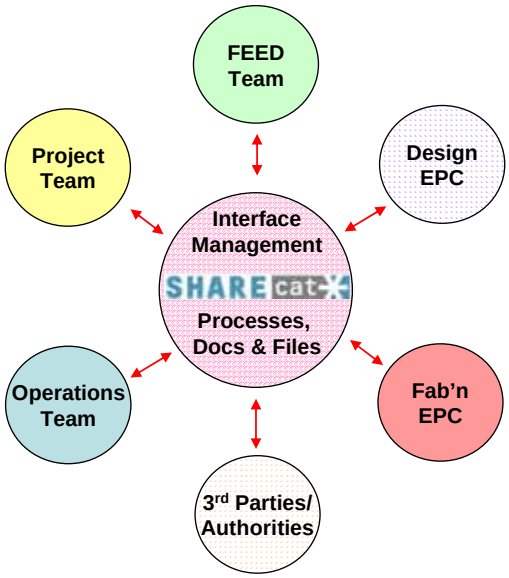
CADISON Engineer2Web

A new module in Cadison, 'Engineer2Web' provides location-independent access to current engineering information in a multi-user environment. Engineer2Web was developed by IT and Factory's new parent company Neilsoft. More from www.ITandFactory.com.

0715_19.3 McLaren Software Enterprise Engineer for Assets

Enterprise Engineer for Assets is designed to assure asset engineering document integrity for owner operators.The application is built around a controlled repository of officially sanctioned asset documentation including engineering documents and drawings, the asset information vault (AIV). The AIV holds standard operating procedures, as-built drawings and plant documents. The central repository supports change management across multiple engineering projects. Clients including Petro-Canada contributed to the design of the new tool. More from www.mclarensoftware.com.

0715_19.4 Tektonisk - ShareCat



Hosted engineering document workflow for major projects

Tectonisk ShareCat 'Interface Management Solution' extends traditional communications and collaboration systems with a web-based solution for inter-company technical document review and approval and a collaborative engineering design change control, tracking and approval system. The hosted solution operates using internet technologies outside client and third party firewalls. More from www.sharecat.com.

0715_19.5 Trimble new FX scanner

Trimble FX Scanner

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Trible's new 'FX Scanner' 3D laser measurement system is used to capture as-built data from platforms and plants. The scanner offers a 360° x 270° field of view and data capture rates of over 175,000 points per second. Interferences to 2D and 3D CAD shapes for use with AVEVA, Intergraph, Autodesk, Bentley and other systems. More from www.trimble.com/srv_psp.shtml.

TW0715_20 The Data Room – Technology Watch subscription information

This report has been produced as part of The Data Room's Technology Watch reporting service. For more on this subscription-based service please visit the Technology Watch home page or email tw@oilit.com.

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