Global Collaborative PLM Solutions for sub-sea applications

*How to increase interoperability using ISO standards*

10th NATO LCM Conference, 28/29 January 2014
LIFE CYCLE MANAGEMENT IN NATO
From Theory to Action

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World leaders in Industrial Data Management using ISO standards

- **Data modeling**
  - Create your own data models, or use for viewing and documentation (ISO)

- **Database management**
  - The ideal tool for data integration and application development projects

- **Rule engine**
  - Validate your data sets, using your own business, knowledge rules or any other sets of rules

- **Web services**
  - For use in web server applications (thin clients)

Universal Solutions for Interoperability and Sharing of Product Data
Jotne in Subsea: Engineering & Manufacturing

Subsea Structures
Manifolds, PLEM, PLET, Riser bases

Subsea Pipeline products

Flexible Pipe laying equipment

Active Pipe Support
Oil and Gas projects:

PLCS (ISO 10303-239) is used in daily operations managing oil and gas projects. Some selected projects:

- Eldfisk Pig Launcher
- DRESSER-RAND, Bigfoot, Gas Turbine power module, customer Chevron
- **Njord A Subsea Manifold System**, customer Statoil
- DRESSER-RAND TURK 3, Gas Compression Modules, Customer Türkmengaz
- SVALIN PLETs and PLRs, Customer Subsea 7
- EKOK Aibel Office Module for end Client Conoco Philips
- BOD ROV Hangar, customer Oceaneering
- Vigdis Feed Study, customer Statoil
- Windpower, Anode Tripods, Statoil
- Future yard planning study
Key Figures

- Duration: 12 months
- Engineering hours: 10,000
- No. of main suppliers: 6
- Number of Documents: 1000
- Weight: (*3) : 93,000 kg
- 3D models: 35
- Engineering reports: 10
- Project members:
  - Internal 10
  - External 100

Video showing installation
User perspective
Not an integrated environment

Engineering Tools
- SolidWorks
- SOLID EDGE
- AutoPlant
- Autodesk Inventor
- ANSYS
- CFX
- STAAD.Pro
- Robot Millennium
- AutoHydro
- OhmTech AS

Office Tools
- Outlook
- Visma
- Mathcad

Customer Tools
- Ingest tools
- FTP Sites
- eRoom
- ProCoSys
- ERP

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Complex situation needs new solutions

Overall Requirements:

1. Spending too much time on administrative work (30% is finding info)
2. Standardized engineering environment and dashboard
3. Mandatory with Physical/Product Breakdown structure (PBS)
4. Standard Activity Breakdown (SAB)
   - Manage: Resources, Material, Facilities, Time, Cost etc
5. Support sharing and exchange of high quality information
6. Must be easy to use
7. Have to work with NORSOK standards
Jotne IT staff had the challenge

The Jotne IT team reused knowledge and technology from advanced Aeronautics, Space and Defence programs to provide a new solution, the TruePLM application adopted for Subsea systems.

Systems Engineering principles and detailed Configuration Management functionality from Aerospace
True Product Lifecycle Management

• Scope
  – To develop a new generation solution for life-cycle data sharing and long-term archiving targeted for adoption by the Sub-sea Industry

• Main requirements
  – Basic project / system management
  – System lifecycle support
  – Project data sharing / supply chain management
  – Team collaboration
  – Version and configuration control
  – Document and data management
  – Concurrent engineering/ document dependencies
  – Long-term archiving / re-use

• Enabling technology
  – International standards for product data

NORSOK STANDARD
Z-014
Edition 2, May 2012
Use cases – Summary

- **Product breakdown structure oriented engineering**
- **Document and data management**
  - E-mails as documents
  - Search
  - History tracking
  - Configuration control
  - Dependencies / sticky notes
- **Concurrent engineering**
  - Project cooperation
  - Supply chain management
  - Notifications
  - Review capability
- **Lifecycle support**
  - Record data along the life cycle
- **Interoperability**
  - Communicate with external formats
  - Import/export using STEP/PLCS DEX
- **Archival**
  - Retention over long periods of time
  - Retrieval application independent
Project set-up

- Project data management
- History tracking
- Data packaging and review
- Concurrent Engineering support
- Feature extraction
- Handover Archiving
Project set-up

NJORD A – Subsea Manifold Systems
Project set-up

• **Set-up options:**
  – Define from scratch (especially Physical/Product Breakdown Structure- PBS)
  – Import from files (PLCS + RDL), using OWL for Reference data
  – From templates in the application

• **Configurable concepts:**
  – Use reference data to define the names for:
    • Scheduled events types (ISO/ECSS / NORSOK)
    • Disciplines (ISO/ECSS / NORSOK)
    • Document content types (from requirements)
    • File formats (dynamically extended)
    • Document status (ISO/ECSS / NORSOK)
    • Properties (dynamically extended)
    • Sources of data (from requirements)
    • User roles
  – User administration
Project set-up: scope of data

• **Product information**
  – Product breakdown
  – Product breakdown change history
  – Documents (all submitted versions)
  – Metadata for breakdown elements and documents
    • E.g. state of approval
  – Relationships among documents
  – Relationships among documents and breakdown nodes
  – Baselines

• **Project information**
  – Reference data
    • Classes and sub-classes
    • Properties defining the concepts used in the project, such as document metadata
    • Selectable values in GUI
  – Milestones: what is planned
  – Scheduled events: ongoing reviews, etc
  – Actions: to-do lists, who, what and on which objects
  – Access control: who has permission to do what
Project data management

- Project set-up
- Project data management
- History tracking
- Data packaging and review
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- Handover Archiving

TruePLM

Client

Time Registration

Procurement

Engineering

Construction

Sub – Contractors & Suppliers

Accounting, Finance and Admin
Project data management

A = Offshore
AD = Subsea
ADC = Riserbase
ADCB = Manifold / Piping Area

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Project data management

The challenges of the Information Age

- **Interoperability** of information technology, addressed by data exchange & sharing solutions
- Common enterprise-wide views of information, addressed by data integration solutions
- Obsolescence of information technology, addressed by data archiving solutions
- Freedom from vendor lock-in, addressed by open data solutions
- Multiple viewpoints, addressed by solutions embodying data independence
History tracking

- Project set-up
- Product data management
- History tracking
- Data packaging and review
- Concurrent Engineering support
- Feature extraction
- Handover Archiving
History tracking

- During the project lifecycle, a lot of changes happen
  - In document contents
  - On the product structure

- Sometimes you need to know
  - How the project data looked at some critical point
  - What changes happened since then, and why
  - Who and when did it

- TruePLM solution:
  - History tracking
    - Document versions
    - Product data versions
  - Baselines / Data packages

- Document check-out/in
  - Lock documents for other users
- Versioning
  - Compare document versions
  - Go back in PBS history
- Compare baselines
Data packaging and review

- Project set-up
- Mission data management
- History tracking
- Data packaging and review
- Concurrent Engineering support
- Feature extraction
- Handover Archiving
Data packaging and review

– Where are the documents we need now?
– Which version of each document is the right one to read / review / edit / comment?
– Why was a document changed and by whom? Does anyone remember?
– Which documents are relevant...
  • On a given project subsystem / discipline / subdomain ...
  • On a given phase of the project life cycle
  • For a given event, such as a review, meeting, evaluation...

The solutions are not trivial ...
– Especially on projects that generate large amounts of documents, and
– When data and documents evolve during the lifetime of the project, and
– When documents and data are generated from different sources
  • Subcontractors, external systems, ...
Data packaging and review

- Additional uses of data packages
  - Can be used as a “checklist”: data packages can contain versions of documents that are expected, but not yet submitted.
  - Data packages can be versioned.

New issue of this document is expected, but still missing!
Concurrent engineering support

- Project set-up
- Product data management
- History tracking
- Data packaging and review
- Concurrent Engineering support
- Feature extraction
- Handover Archiving
Concurrent engineering support

• Approval
  – Modify document status

• Reviews and related activities on data packages

• Actions on documents
  – Assigning actions to persons, on objects
  – Notifications to the users
  – Keeping an overview on action statuses

• Informing and warning other users about document version issues
  – Sticky notes
  – Document relationships + red flags

• Overview of the project milestones
  – Baselines and events can be related to milestones
Handover, Archiving

- Project set-up
- Mission data management
- History tracking
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- Concurrent Engineering support
- Feature extraction

Customer Tools
- Ingest tools
- FTP Sites
- eRoom
- ProCosys
- ERP

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Space brings savings to offshore oil and gas

18 November 2013 Software for building ESA spacecraft is helping to improve safety and drive down costs for engineers operating deep sea oil and gas installations.

The expense of extracting energy from under the sea and the potential for fire or oil spills should things go wrong mean that companies are always looking for better ways to operate offshore installations.

Now, the EDM TruePLM™ (TruePLM) product lifecycle management tool, developed for ESA spacecraft programmes is improving efficiency for oil and gas industries.

Having spent years working with ESA on their Cassini–Huygens and Envisat satellites, Sverre Sandal from Jotne Industriell, a Norwegian company primarily involved in energy exploration, saw how TruePLM could also work for offshore industry because, “spacecraft and underwater machines present similar technical challenges.”

“Every project, whether it’s a satellite or an oil rig, generates piles of documentation from designs, calculations and testing to contracts and emails,” says Sverre.

http://www.esa.int/Our_Activities/Technology/TTP2/Space_brings_savings_to_offshore_oil_and_gas
Conclusions of using TruePLM for Oil&Gas

- A tool to improve efficiency in engineering, operation and support

- Implementation of Oil and Gas structuring and standards according to NORSOK in the PBS, SBA and document structure

- All project data across phases and disciplines collected in one database, from feasibility study to decommissioning.

- Several organisations can work on the same PBS by managing read/write/delete access

- Oil and Gas projects have long durations, 20-40 years is common; ISO standard formats important to be able to read the data over time

- Focus on transparency: History tracking of changes with date and user, every version viewable and downloadable. A must for final documentation and Life Cycle Information (LCI) Management.
From idea to manufacturing and operations

Share, exchange and archive your PLM data

Video about Interoperability