Asset Lifecycle Information Management solutions for Oil & Gas industry

Marcin Stecki, Bentley Systems Inc.
Marcin Stecki

- Let me introduce myself.
- 6+ years with Bentley
- MSc Eng. in Chemical and Process Engineering.
- Sales Director for 12 Central-Eastern European countries
- 20+ years experience in different CAD systems.
- hiker / sailor / biker
About Bentley

Bentley’s mission is to provide innovative software and services for the enterprises and professionals who design, build and operate the world’s infrastructure - sustaining the global economy and environment, for improved quality of life.
A Global Company

Since 2006, more than **$1 billion** invested in R&D and Acquisitions
Bentley managed suite of applications

- Conceptual
- Functional
- Physical
- Analysis
- Construction

Plant Information Model

Clash Resolution

Bentley Navigator

Animation/Simulation

External Planning Tool

Functional Model

Physical Model

Infrastructure Model

Planning & Scheduling

Plant Lifecycle
OpenPlant solution

- OpenPlant Power PID
  - Data Manager
  - Bentley DataSheets
  - Bentley Instrumentation and Wiring
  - Bentley Hookups
  - Promis*e

- OpenPlant Modeler
  - OpenPlant Isometrics Manager
  - OpenPlant Model Server
  - Raceways and Cable Management

- Bentley Navigator
  - Clash Management
  - Schedule Simulation

„Open”?

- Open data structure (ISO 15926)
- Open for many file formats
OpenPlant solution

• OpenPlant Power PID + project database (PDB)
  – Data Manager
  – Bentley DataSheets
  – (Bentley Instrumentation and Wiring)
  – (Promis*e)

• OpenPlant Modeler
  – OpenPlant Isometrics Manager
  – (OpenPlant Model Server)

• Bentley Navigator
OpenPlant PowerPID
OpenPlant Modeler

- Equipment
- Piping
- Piping Supports
- Cable Trays
- HVAC
OpenPlant Isometric Manager

- Easy, centralized iso management for the whole project
Point Cloud from 3D laser scanners
3D Modeling from Point Cloud
Bentley’s **ProStructures** is the combination of **ProSteel** & **ProConcrete**. Advanced 3D Modeling, Documentation, & Detailing of Steel and Concrete Structures
AutoPIPE CAE Pipe Stress Analysis & Integration

StressISO

Data Integration

Bi-Directional Exchange

AutoPIPE

Data Export

OpenPLANT/AutoPLANT

AutoPIPE Nozzle

Data Integration

Bi-Directional Exchange

PlantFLOW

PULS
AutoPIPE Modeling Interoperability

PDS

SmartPlant

CAESAR II

Bi-Directional Exchange

AutoPIPE

Data Export

SolidWorks, Inventor, CATIA

Data Export

Data Export

Data Export*
AutoPIPE Vessel V8i powered by Microprotol

Pressure Vessels
Tanks and Boilers
Heat Exchangers

Codes

ASME
AD-2000
MERKBLATT
American Petroleum Institute
CODAP
PG
BSi

Nozzle with or without pad, set-in or set-out
STAAD.Pro
Structural Analysis & Design Integration
Offshore – a special case

• Every Offshore project is different and risks are high
  – Geology, water depth, meteorology, distance from shore

• The most innovative and demanding offshore projects use SACS, MAXSURF and MOSES
Bentley Navigator

Project review

• Dynamic feedback
  – all disciplines, many applications
  – components information

• Markups management
  – Support for 3D
  – Audit trail

• Export to PDF
Analysis

- Clash management
  - fast detection
  - one click markups
- Schedule simulation
  - Integration with MS Project, Primavera
- Animations
- Visualizations
- Mobile applications
Beyond mobile review: “Interactive Inspection”
Global Trends - Oil & Gas

Summary:
- **Asset Performance**
  - Maximizing Current Information & Solutions
  - ‘Hands-on’ approach during Handover into Operations
- **Collaboration**
  - Data Exchange & Access
  - Data Quality/ Availability
- **Mobility**
  - Connecting the mobile workforce
- **SaaS/ Cloud/ Security**
  - IT systems/ data/ asset documentation
Poor Asset Information Is Expensive

When Information Quality drops 8% - Productivity Drops 50%

Source: ICM - Based on 8 data sets used in series and each data set at an integrity level varying from 75% to 100%
Why ALIM?

Lack of Asset Information Management Is Expensive

Infrastructure Projects (CAPEX)
- Increases in capital costs
- Extends project schedules
- Increases project risk

Operation and Maintenance (OPEX)
- Higher operational cost
- Lower asset availability and productivity
- Lost revenues and profitability

Environmental, Health and Safety
- Risk of non-compliance (fines or shutdown)
- Increasing personnel cost and productivity
- Higher rate and cost of incidents
Poor Asset Information can be Disastrous

“… we learned that the blowout preventer had been modified in unexpected ways…”

“… BP told us the modifications on the BOP were extensive. After the accident, they asked Transocean for drawings of the blowout preventer. Because of the modifications, the drawings they received didn't match the structure on the ocean floor…”

Source: House Committee on Energy and Commerce hearings on the Deepwater Horizon disaster
AssetWise is an information modeling platform for delivering lifecycle information management to operators of infrastructure assets…

&

a suite of applications and on-line services to improve management and operational performance, safety and compliance of infrastructure assets.
Oil & Gas Asset Lifecycle

Front-End Conceptual/Project Feasibility

Conceptual Design

Front-End Engineering & Design (FEED)

Cost Estimation, Review & Approval

Detailed Design & Engineering

Procurement, Site Preparation & Construction

Offshore – remote fabrication, transportation & installation

Decommissioning

Modification & Turnaround

Operations & Maintenance

Commissioning & Handover

CAPITAL PROJECT/ENGINEERING INFORMATION SYSTEM
Oil & Gas Asset Lifecycle

Interoperability
- Accepts engineering information from any source
- Transfers engineering information to any data user
- Maintains engineering intelligence & data integrity

Standards
- Built on industry standards
- ISO 15926 for plant information

Usability
- A practical system that can be used by all engineering disciplines

A Project Information Management Hub Built On:

Capital Project/Engineering Information System

- Front-End Conceptual Requirements
- Front-End Engineering & Design
- Conceptual Design
- Decommissioning
- Modification & Turnaround
- Operations & Maintenance
- Commissioning & Handover
The Oil & Gas Solution ... 

...is a suite of design, analysis, simulation and data management software products for engineering professionals and asset owners used to design, build and operate oil & gas assets both onshore & offshore...

- Develop design options
- Perform analysis and simulations
- Create project & construction deliverables

- Undertake design reviews
- Identify material requirements
- Optimize fabrication/construction sequencing into handover
- Offshore – remote fabrication, transportation & installation

- Manage/ maintain & optimize assets
- Maintain accurate documentation
- Integrate asset data with other enterprise systems
Solution Architecture Concepts
Trusted Information

• eB (enterprise Bridge) provides the means to ensure trusted information is available where, when and to who it is required.

• eB solutions are about…
  – Identification and Classification
    • What is it?
  – Relationships/Links/Context
    • What is it for?
  – Responsibility
    • Who owns/uses/needs it?
  – Control of Change
    • Who can change what? Where are all copies?
    • What is the impact, cost and scope of change?
    • What/who/when changed?
Information Modeling

- Classification
- Relationships
- Information Reach
- Behavioral Control
- Presentation
Bridge Perspective

Solutions for Information Management

Document & Content Management Solutions

Rapid access to accurate information in context

ERP
Maintenance
Product Data

Plant, Product, Process Management Solutions
Collaborative Solution

Requirements Management

- CAD
- Web
- Email
- Office

Document Management

Closed Loop Change Process

Item Management

Records Management

- ERP
- CRM
- HR
- Marketing
Bentley eB AssetWise

Information Applications
- Document Control
- Records Management
- Knowledge Management
- Requirements Management
- Configuration Management

Packaged Interfaces
- Corrective Action
- Operating Experience
- Change Controller
- Engineering Service Request
- Cable/Raceway Management
- Training & Certification
- Master Equipment List
- Engineering Maintenance
- Mod Package Designer
- User Created Applications...

Platform

Information Modeling | Information Integrity | Information Services

Oil & Gas Industry Information Model (eB Insight)
Logical Architecture

Browser ➔ HTTP(S) ➔ Web Server ➔ HTTP(S) ➔ Firewall ➔ Director

-.NET Remoting

Index ➔ Storage
ADO.NET ➔ .NET Remoting

Repository ➔ Metadata ➔ Files
Enterprise Solution Architecture

- Configuration Control
- Controlled Docs
- Records Management
- Engineering Design
- Corrective Action
- Human Performance
- Knowledge Management
- Qualifications
## Representative Oil & Gas Users Today ...

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### EPC/ EPCM’s
- KBR
- Technip
- Bechtel
- Zetong
- Foster Wheeler
- Mustang
- Worley Parsons
- Fluor
- Eni
- Saipem

### Constructors
- McDermott
- Zachry
- Jacobs
- ConocoPhillips
- Marathon
- Petrobras
- ExxonMobil
- Saudi Aramco

### Owner Operators
- Suncor
- Statoil Hydro
- Syorcrude
- Shell
- BP
- Total
- Petrocanada
- TCC
- BG Group
- BG Group
- PEMEX
- PEMEX
- PEMEX
- PEMEX
- PEMEX
“Improving plant data understanding and maximising information completeness, correctness and consistency (3C’s) in a single consistent portal environment.”

Background

- Capital projects historically suffered from:
  - Inconsistencies in the level of data provided during handover from EPC’s/Suppliers
  - Lack of data standardization across projects to support operations
  - Lack of standardization and associated workflows supporting change management

Data Repository & Portal Use Case

- Implement a Data Repository based on ProjectWise Lifecycle Server to centralize all project data and deliverables
- Provide a Portal into the Data Repository supporting easy data access in operations
- Formalize management of change/revision control workflows

Onshore and Offshore Facilities:
Reduced man-hours - find, validate & manage relevant project information
Business Value/ Benefits

- **Precise Information Specification**
  - Improving understanding of what they have, & what they DON’T have
    - Reduction in man-hours to find data

- **Streamlined Handover**
  - Maximising information completeness, correctness & consistency (3C’s)
    - Improved data integrity/ quality

- **Web Portal Access for Operations**
  - Providing a single, consistent access point for all asset data, documentation & maintenance information
    - Reduction in man-hours to find data

- **Management of Change**
  - Tracking the as-maintained asset while ensuring maximum information integrity
    - Improved control & visibility to engineering changes
BP Indonesia implemented a combined Data Repository & Engineering Content Management System to centralize all project data and deliverables to support the $5 billion Tangguh LNG Facility.

Tangguh LNG Project

BP
Papua, Indonesia
Onshore and Offshore LNG Facilities:
Reduced man-hours to support data handover

Background

• Capital projects historically suffered from:
  – Inconsistent Data formats during data handover from EPC’s/ Vendors into operations
  – A lack of project collaboration across project Stakeholders
  – Too many documents, not enough data!

Centralized Data Repository

• Implement a Data Repository/ Engineering Content Management System based on ProjectWise Lifecycle Server to centralize all project data and deliverables

• Integrate data repository to plant asset management systems

• Validate data during EPC phase - formalize management of change/revision control/ data QA workflows

“By transferring the EPC’s deep, detailed knowledge of the project to the day-to-day operations managers, BP Indonesia gained significant economic and competitive advantage.”
Business Value/ Benefits

• Precise Information Specification
  – Streamlined data formats & overall data management
    – Reduction in man-hours to manage, validate & maintain data

• Streamlined Handover
  – Maximising information quality during handover
    – Improved data integrity/ quality
  – Close integration with O&M systems
    – Lower cost of ownership to build/ manage/ maintain as-built data

• Management of Change
  – Tracking the as-designed asset during the EPC phase
    – Improved control & visibility to engineering changes

“ProjectWise Lifecycle Server not only provided quick access to data and project work instructions, it also automatically tagged document links in an easy-to-use system that operations staff are motivated to use and maintain.”
Shell – Structural Integrity Leadership

“Our Assets are safe and we can prove it.”

• Operating successfully means operating with integrity leadership within all aspects of its business
  – Design Integrity
  – Technical Integrity
  – Operating Integrity

• Technical Integrity leadership on pressure envelope assets with a fully integrated inspection and maintenance process and system based on Bentley APM, SAP and EDW

• Driving global consistency and reducing duplicate systems
Bentley APM at Shell

- Global CIMS (Corrosion Inspection Management System)
- Supports overall inspection work process, improving link between inspections and maintenance
- SAP integration to facilitate detailed and auditable process of risk-based inspection planning, execution, analysis and corrective action
The Bentley Oil & Gas Solution Advantage

Multi-Vendor, Cross-Discipline Engineering Content Management
• Mitigates the risk of costly project errors and project delays by:
  ✓ Providing a federated single source of truth for work-in-progress projects
  ✓ Accelerating access to project information to enable real-time collaboration

Iterative, Closed-Loop Project Review/Change Process
• Reduces cost and time to gather and act on project changes by:
  ✓ Dynamically capturing and incorporating work-in-progress feedback
  ✓ Maintaining an audit trail of review feedback and its source

Multi-Channel Engineering Asset Management
• Improves quality of project information available to all stakeholders by:
  ✓ Automating standards-driven publishing/access to intelligent project deliverables
  ✓ Delivering information in multiple formats, to many devices, for many purposes
  ✓ Data mobility accessible in a secure managed environment
  ✓ Built in an Open-Information Architecture (ISO 15926)
Thank you