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Natural Gas Industry Workflow with A360 & BIM 360 Glue

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Learning Objectives

- A360 & BIM 360 Glue Workflow in the Natural Gas Industry
- Identify the correct resources to ensure success
- Lessons learned

Description

This presentation will walk you through the workflow of utilizing A360 and BIM 360 Glue software from a perspective of the natural gas industry. Witness the lifecycle from engineering through construction along with the key resource usage and efficiencies. Discuss lessons learned and key items utilized to make these tools successful additions to a Building Information Modeling (BIM) project lifecycle.

Speaker

William Ellsworth - Sr. Project Manager for EQT, a Natural Gas Production and Midstream company located in Pittsburgh, PA. He works with Construction and Engineering to provide effective and efficient software. Previously he managed a team of Piping, Mechanical and Electrical designers, along with 3D and Document Control administrators. Providing overall guidance for EQT Midstream’s design engineering software, including AutoCAD Plant 3D, AutoCAD P&ID, Autodesk Navisworks, AutoCAD Civil 3D, and Autodesk Vault. William was a member of the Plant Standards Panel during the 2012 Bentley LEARNing Conference. He helped the audience understand how a standard like ISO 15936 is beneficial to standard-based workflows and how DuPont is utilizing these standards. Bentley published ‘DuPont Standardizes on Bentley OpenPlant Based on Results of Rigorous Six Sigma Evaluation Process’ which William was noted in. He presented ‘A Natural Gas Company’s Journey from 2D to 3D and Beyond at Autodesk University 2016.'
BIM Project Life Cycle – Natural Gas Industry

The US National Building Information Model Standard Project Committee has the following definition:

*Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition.*

Traditional building design was largely reliant upon two-dimensional technical drawings (plans, elevations, sections, etc.). Building information modeling extends this beyond 3D, augmenting the three primary spatial dimensions (width, height and depth) with time as the fourth dimension (4D) and cost as the fifth (5D). BIM therefore covers more than just geometry.

Building information models span the whole concept-to-occupation time-span. To ensure efficient management of information processes throughout this span, a BIM manager (also sometimes defined as a virtual design-to-construction, VDC, project manager – VDCPM) might be appointed. The BIM manager is retained by a design build team on the client's behalf from the pre-design phase onwards to develop and to track the object-oriented BIM against predicted and measured performance objectives, supporting multi-disciplinary building information models that drive analysis, schedules, take-off and logistics. Companies are also now considering developing BIMs in various levels of detail, since depending on the application of BIM, more or less detail is needed, and there is varying modeling effort associated with generating building information models at different levels of detail.

EQT’s integrated working between all disciplines by using a single, shared project model which is held in a common data environment (Vault/Autodesk Design Suite). All parties can access and modify that same model, removing the final layer of risk for conflicting information.

Benefits of BIM at EQT

- Labor hours
  - Less communication errors
  - Quicker revision process
- Less material loss
- Less rework in Construction Process
- Less errors due to Software interoperability

BIM Implementation at EQT has shown to achieve an ROI of min 10%. A Collaborative BIM Model is a truly-interoperable system that offers complete integration and helps project teams tweak and change modules in the models in every stage of a project's work cycle! And interestingly, there is no data loss or conflict in the BIM process.
- **Front End Design**
  - Preliminary General Arrangement
  - Process Flow Diagram

- **Detail Design**
  - AutoCAD P&ID
  - Spec & Catalog
  - P3D

- **Review/QC**
  - Deliverables
    - Orthographic drawings
    - Isometrics
    - Reports
      - Line List
      - Tag List
      - Navisworks Model

- **Construction**
  - BIM 360 Glue
  - A360
  - UAV Laser scanning
Font End Design

AutoCAD P&ID

- Project Manager organizes all of your project P&IDs
- P&ID is a simple-to-use drafting tool with built-in intelligence designed to increase P&ID productivity
- P&ID data can be simply managed through Data Manager
- Reports can be created quickly and easily either from inside AutoCAD P&ID or outside the drawing using AutoCAD Plant Report Creator.

Open the project:

Create new Drawing and assign drawing number.
When the drawing opens, make sure you are in the P&D Workspace. If not, click on the workspace symbol:
Drop in Equipment first (Compressors, Pumps, and Vessels) and assign tag information:

Run process lines and assign information:

Insert page connectors, right click and connect to page connectors on other drawing:
Using Data Manager to update equipment:

- Equipment name
- Tag
- Information

Now use Export / Import to add model number and supplier by an external user through MS Excel. First export the data to Excel:

- You can edit the information and import back into Data Manager

- Import changes back to the project
Reporting:

- Using the Data Manager, select Project Reports in the pull-down:

- Using the Report creator select the project and the type of report to generate:
  - Report creator is used also during the Review process. Ex: BOM Report from Models
Detailed Design

Autodesk Plant 3D Spec Editor / Catalog Editor
Spec Editor

- Creates and modifies spec sheets.
- Using the Spec editor, you can add parts from a catalog to create a spec sheet. You can then specify which fittings to use when routing for a specific pipe size.

Adding Custom Properties Ex: Part number
Right click on the part

when window appears click on Edit properties
In the edit part window Enter Definition
Display name: FACILITIESITEMNUMBER
Default value: (Blank)
Add property to: All Part Groups
Field Name: FACILITIESITEMNUMBER (name of the field that it will pull from the catalog)
Field Type: Text
Field Size: 8 (number of characters)

Click on Add and OK
Catalog Editor
- Creates and modifies Catalogs.
- Using the Catalog editor, you can add new parameters to part families. You can then specify which fittings to use when routing for a specific pipe size.

Click on Catalogs
In the pull down click on Modify Catalog Properties
Enter Property Definition
  Display name: FACILITIESITEMNUMBER
  Default value: (Blank)
  Add property to: All Part Groups
  Field Name: FACILITIESITEMNUMBER (name of the field in the catalog when you export)
  Field Type: Text
  Field Size: 8 (number of characters)
After Creating the Fields in the Catalog, Export it to an excel file to edit.
In the select export settings pull down to Full Catalog Data Export
Choose the location to export the catalog to
Open Excel
Open the Catalog file to edit
Notice that the Facilities Item Number
You can now edit the new Field
Add Facilities Item Number and same to Material code
Material code can be searched in the Catalog Editor
Return to the Catalog Editor

Click on the Import from Excel Button

Notice the highlighted areas, these are the areas with new data

Accept the updates

Click Apply

Click OK
In the Catalog Editor you can now search by number assigned
Right click on part and add to Spec

Choose the Spec to add to

You can then see its added to the Spec

Right click and Edit properties

When the Edit parts window pops up, you will now see that the Field data has been transferred from the catalog to the Spec
Equipment Design - AutoCAD Plant 3D

- AutoCAD Plant 3D (P3D) is a simple-to-use comprehensive 3D modeler for performing plant design including; structures, equipment and piping layout to create piping isometrics and orthographic drawings.
- Piping isometrics can be easily created using the AutoCAD Isometrics function, which has a graphical user interface for easy customization.
- Inventor models can be imported into the P3D model as equipment and connected intelligently to P3D piping.
- Structural models can be imported to P3D from Inventor.

Structural Model:

- Structural model can be created using AutoCAD 3D and X-Referenced in a dwg file from Inventor.
- Using Plant 3D, you also can create the structural shapes. (Structure Tab)
Equipment Layout:

- Models Imported ADSK file:
  - ADSK file are smaller and have less detail

- Create equipment using Inventor models saved as a .dwg file format.
- Use the Plant Equipment Convert function to make this a Plant equipment.
- Assign equipment tag and nozzle locations
Models can also be created in Plant 3D

- They can be modeled and converted to Intelligent Equipment

Piping Layout

- Unload Structural layout and leave the equipment you are piping "on" from the External References window.

- Use the P&ID Line List to create pipe and valve with tags already assigned
- You can also choose the pipe size and spec selector from the ribbon.

- Route pipe from nozzle location of one equipment to the other.

*Notice in the properties of the Valve*
*Line Number Tag and Tag are transferred from the P&ID*
*Description and Facilities Item Number are transferred from the Catalog and Specs*
Review/QC

Isometric Creation

- Click on the ISO menu
- Click the type of ISO you would like
- When ISO window comes up choose line number and the ISO style.

Orthographic Creation

- In the Ortho View Tab
- Using the New View button on the ribbon, this window will appear.
• Choose the equipment, structure and piping. (Models that apply to this Ortho)

• Choose the orientation for the drawing
• Choose the scale for the view
• Ok to create ORTHO view
Navisworks

You can use the 'fly' and 'walk' commands to review the project:

- In 'walk' mode you have various types of realism.
  - 'Collision' - you will not be able to walk through objects
  - 'Gravity' – you can walk through solid objects
  - 'Crouch' – you will attempt to crawl under or jump over objects in your path
  - 'Third Person' – you can look over the shoulder of an avatar

How to configure Navisworks to show Plant 3D data

Install 3rd party software
Install Ecad Inc. - Fasttrack
Once the software is installed restart Navisworks
You will now see A Fasttrack Navisworks on your ribbon
How to Configure Viewing Settings for Properties Window

In the Home Ribbon
Click down the Select & Search tab pull down
Selection resolution should be set to Geometry
Note: if you do not set this none of the AutoCAD or Plant 3D data will show in the properties window

Click on the selection tree
Click on the select icon

In the Display Ribbon
Click on the Quick Properties and the Properties
Then dock the Properties window
In the Viewpoint Ribbon
In the Save, Load & Playback Tab
Click on the Save Viewpoint
You will know have two windows on the right side of the screen (Saved Viewpoints and Properties)
How to Configure Viewing Settings for Quick Properties
Go to the pull down on the Navisworks Icon
Click on options

Expand Quick Properties
Click on the green plus sign and add a total of 0 sections
Configure the Category and the Property by using the selections underneath each pull down.
Duplicate the configurations below

Now you will see the properties when you hover your mouse over a component
How to add Custom Colors to Equipment and Pipe

Customizing colors to Equipment and Pipe

In the view port ribbon

go to the render style tab

Set to shaded
Now you can right click on objects

Click on Override Item > click on override Color
Choose preferred color form color palette
How to Set the Units

Setting Units
Go to the pull down on the Navisworks Icon
Click on options

Expand Interface
Click on Display Units
Change to Feet and Inches
Set Precision to 1/16
Click OK
How to Set Walking Viewpoint

Walking Viewpoint

    Click on Viewpoint on the ribbon
    Go to the Navigate Tab and Click on Walk
    Next click on Realism, the pull down menu show.
    Check the collision, Gravity, Crouch and Third Person
    When you get to the desired viewpoint follow instructions from Unit 6
How to Set Flyby Viewpoint

Fly by Viewpoint
Click on Viewpoint on the ribbon
Go to the Navigate Tab and Click on Fly
Next click on Realism, the pull down menu show
Un-Check the collision, Gravity, Crouch and Third Person
When you get to the desired viewpoint follow instructions from Unit 6
How to create a saved Viewpoint

Creating a Viewpoint

At the desired Viewpoint
Go to the saved Viewpoints window
Right click for Viewpoints window
Then click again in the Save Viewpoint
Give the Viewpoint a name
Construction

EQT uses cloud based tools.

- A360
  - Latest issued for construction drawings
• BIM 360 GLUE
  ○ Latest released General Arrangement model

• Benefits
  ○ Better team communication
  ○ Errors caught before construction
  ○ Clash detection
  ○ Mark ups for as-built
A360 Workflow – Natural Gas Industry

- Engineering Construction Documents are uploaded by the BIM 360 Admin at key milestones (IFB, IFC, Revisions)

- Construction Project Managers and Field Engineers utilize the latest Engineering Construction Documents in the field as a digital communication device.

  - Communications to Construction and Engineering resources via mobile devices allows for more efficient way of communicating changes, As-Built and solutions.
BIM 360 Glue Workflow – Natural Gas Industry

- 3D Models are uploaded by the BIM 360 Admin at key milestones (IFB, IFC, Revisions)
- Construction Project Managers and Field Engineers utilize the latest 3D Models in the field as a digital communication device.

  - Communications to Construction and Engineering resources via mobile devices allows for more efficient way of communicating clashes, changes, As-Builts and solutions.
Lessons Learned – Natural Gas Industry

**A360 Lessons Learned**

- Eliminates the need for paper in the field.
- The Tablet allows drawings to be in one place and allows revisions to be shared from the designers in the office then downloaded onto the iPad instantaneously via the Autodesk A360 app.
- The Tablet was put into a waterproof/shockproof case so it can be used in all weather conditions where paper cannot.
- Easier P&ID Walk-downs, punch list creation and instant As-Builts.

- P&IDs can be walked down with comments made on the Tablet. These can be uploaded to the engineering Autodesk A360 site for As-Builting the station via an the Autodesk A360 app.

- Punch lists for start-up can be created and sent to construction real time so work can be completed faster.
- Ability to provide instant feedback to Construction/Engineering/Vendor via Screenshots.
- Screen shots of the drawings/model/picture can be taken and drawn on to provide direction to Construction within minutes.
BIM 360 Glue Lessons Learned

- Allows checking of piping/foundations/etc. via AutoCAD 3D model using the Autodesk BIM 360 Glue app:
  - Lines can be "clicked on" to check diameter, grade, wall thickness, and other properties.
  - Proposed changes are easily viewed on the iPad.
- Allows for measurements to be pulled in the field
  - The model is loaded onto the iPad and via the Autodesk BIM 360 Glue app, dimensions from new/existing equipment can be obtained.
  - These measurements were tested to be accurate within an inch.