AUTODESK UNIVERSITY 2014

AutoCAD® P&ID and AutoCAD® Plant 3D: Hidden Treasures in Your Databases

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Code PD5740

Learning Objectives

At the end of this class, you will be able to:

- Understand how AutoCAD P&ID software and AutoCAD Plant 3D software handle databases
- Learn where and how the data is stored in the database
- Learn how to create database views
- Discover ways to use the view's result for your work

About the Speaker

Working in the Plant Industry for 25 years. Started as a drafter and became a supporter and developer for Plant software. Started as a product manager in 2008 to develop PlantTools as additional apps for AutoCAD P&ID and Plant 3D. Wrote books and training manuals for AutoCAD P&ID and Plant 3D. Helped a lot of customers with setting up and customize AutoCAD P&ID and Plant 3D.

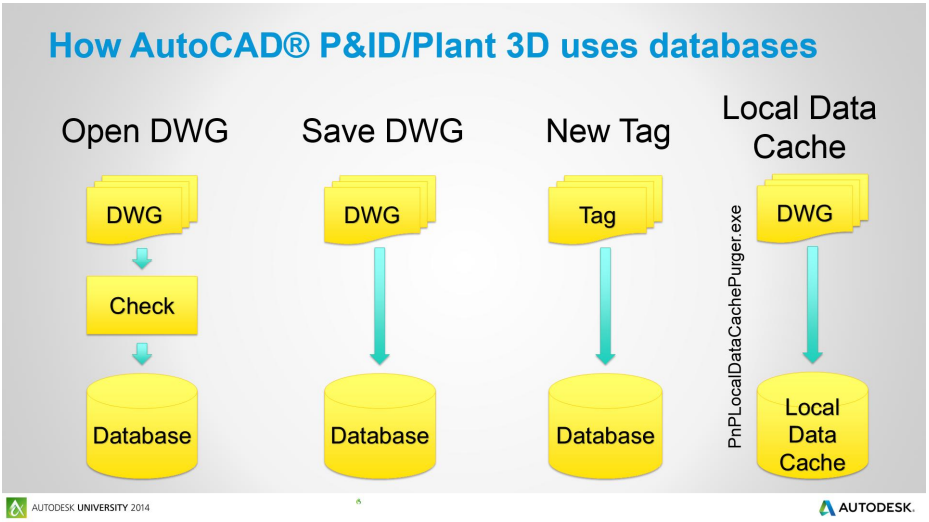
Version 1.0

How does AutoCAD® P&ID and AutoCAD® Plant 3D uses databases?

As you probably know AutoCAD P&ID and AutoCAD Plant 3D do not only store data in the drawing file itself, but store the data also in database files. To have the database in sync the drawing files there is a workflow to make sure that the databases and the drawing files stay in sync. The workflow differs whether you open a drawing file or save for the drawing.

When saving the drawing file in AutoCAD Plant 3D the data in the database will be overwritten regardless of the current content in the database. When opening a drawing AutoCAD Plant 3D first checks if the data from the database matches the data from the drawing. If the drawing has been modified outside this project and their additional or fewer objects in the drawing, then you see a message box telling you that there are inconsistencies between drawing and database and that these inconsistencies will be fixed.

On the other hand, if you make changes in the database and then opened the drawing these changes will be read into your drawing without any notification.

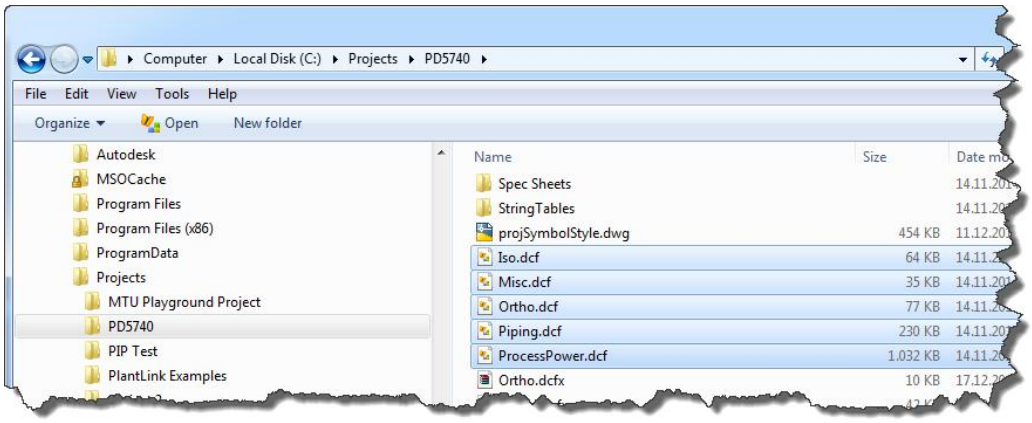


Usually data is written into the database only if the drawing is saved. But there is one exception. As soon as you define a Tag the value will be instantly written into the database. This ensures that Tag will be instantly marked as used as soon as a user defines its value. This may no other user can use that Tag.

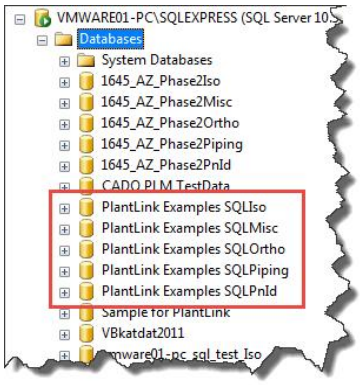
Besides the databases in your AutoCAD Plant 3D project there is also a local data cache. This local data cache is used to improve performance when working with AutoCAD Plant 3D. If you experience any strange behavior in regards to your data it is recommended to run the PnPLocalDataCachePurger.exe.

Where are my databases?

AutoCAD Plant 3D allows you to select between SQLight databases and SQL Server databases. If you use SQLite databases you will find the databases in your project folder. The file extension of SQLite databases is DCF.



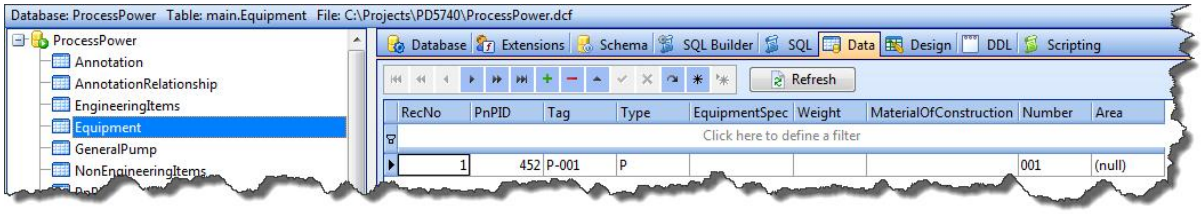
If you use SQL Server you will find the databases on SQL Server. They are up to five databases for each of your project.

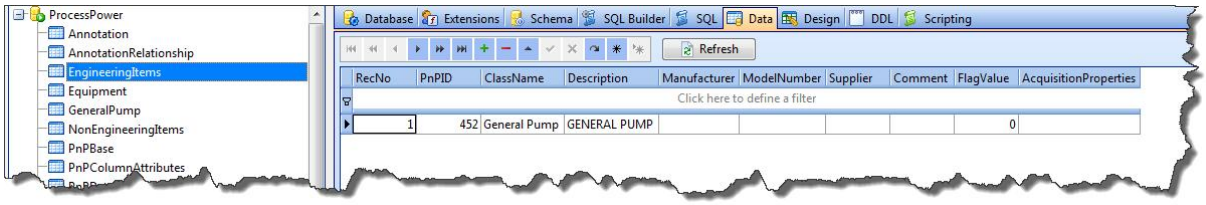


During this handout you use SQLite databases. If you use complex SQL statements you will recognize that there are differences between SQLite and SQL Server. These differences can be minor but also very complex. Sometimes it's a good idea to use Google to get help for your SQL statements.

What is the difference between Table and View

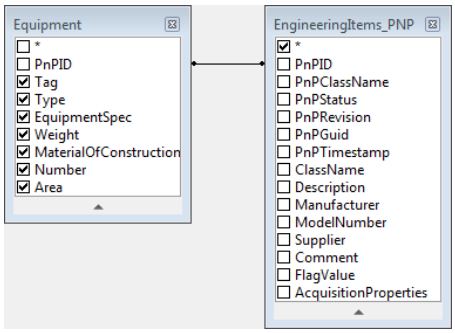
A table can be compared to an Excel worksheet it's a simple grid which contains data. Each of your classes in your AutoCAD P&ID or AutoCAD Plant 3D configuration has its own table.

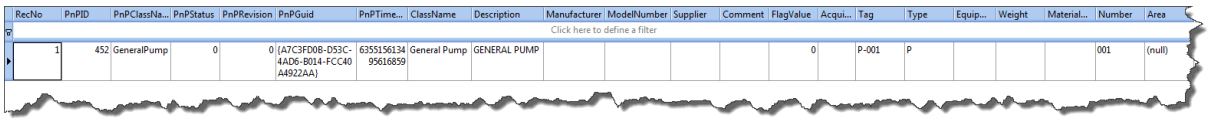




If you on the other hand, views contain one or more tables which have some sort of relationship. In general you are free to define what kind of relationship to tables have, but in regards to AutoCAD P&ID or AutoCAD Plant 3D these relationships are usually predefined.

Equipment_PNP view:



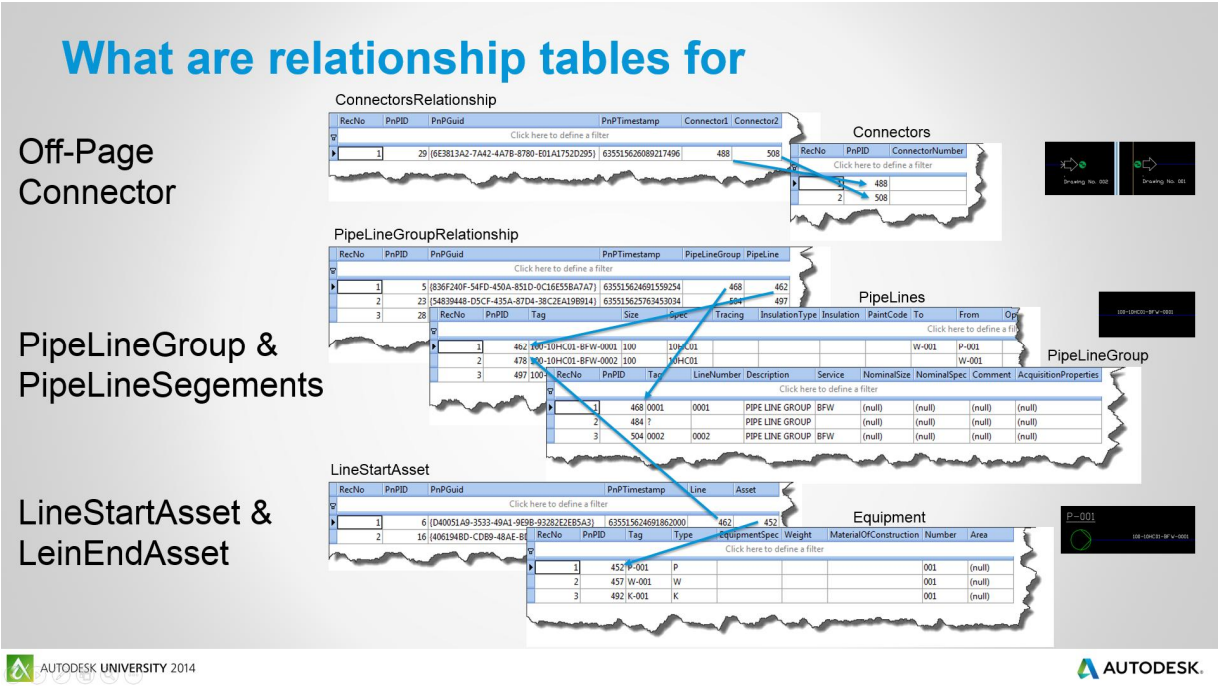


If you look in your databases you will see that there are tables as well as views. The amount of tables and views rises when you add more and more different classes into your project. If you create a fresh project you will see that there are only very few tables and views.

What are relationship tables for?

The tables in your database can be divided up into three types. First we have to system databases which usually start this PnP. Then there are tables which we can call object tables. They contain the actual data of your symbols and lines. Lastly we have the relationship tables. Very often they and the expression relationship. However, they also relationship tables which do not have that expression in their name.

As the name suggests relationship tables show relationships between two objects. For example the relationship between two Off-Page connectors all the relationship between a pipeline and pipeline group. These relationship tables are the most important tables you need for your own views as we will see in the next chapter.

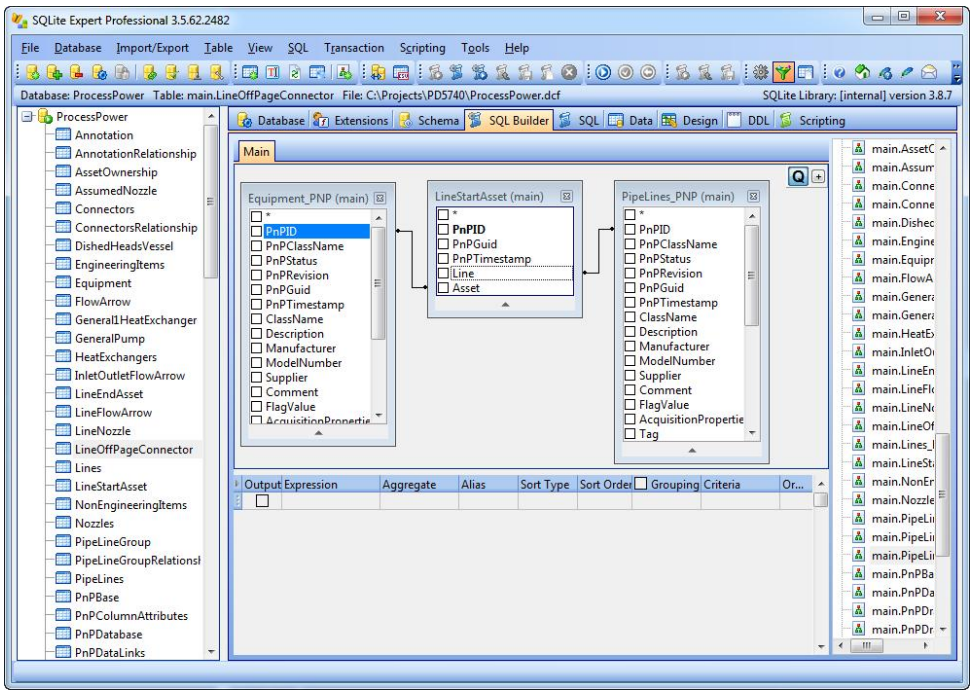


Two very important relationship tables are the LineStartAsset table and the LineEndAsset table. These two tables will show you what symbol is at the end or at the beginning of a pipeline. Essentially this means that you will be able to have data flow from one symbol to another symbol. This comes in handy when you are limited by the use of acquisition rules within your project setup.

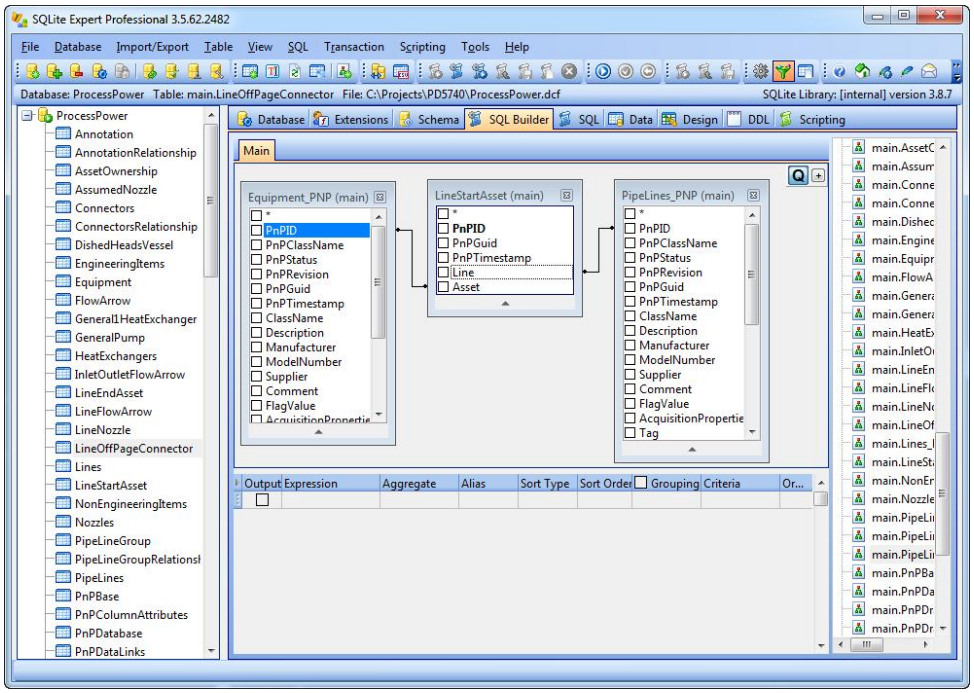
How to create your own Views?

To create your own views you need some sort of SQL Editor. My recommendation is to use SQLite Expert Professional. There is also a Personal edition. However, feature we need to build our own views is not part of the Personal edition.

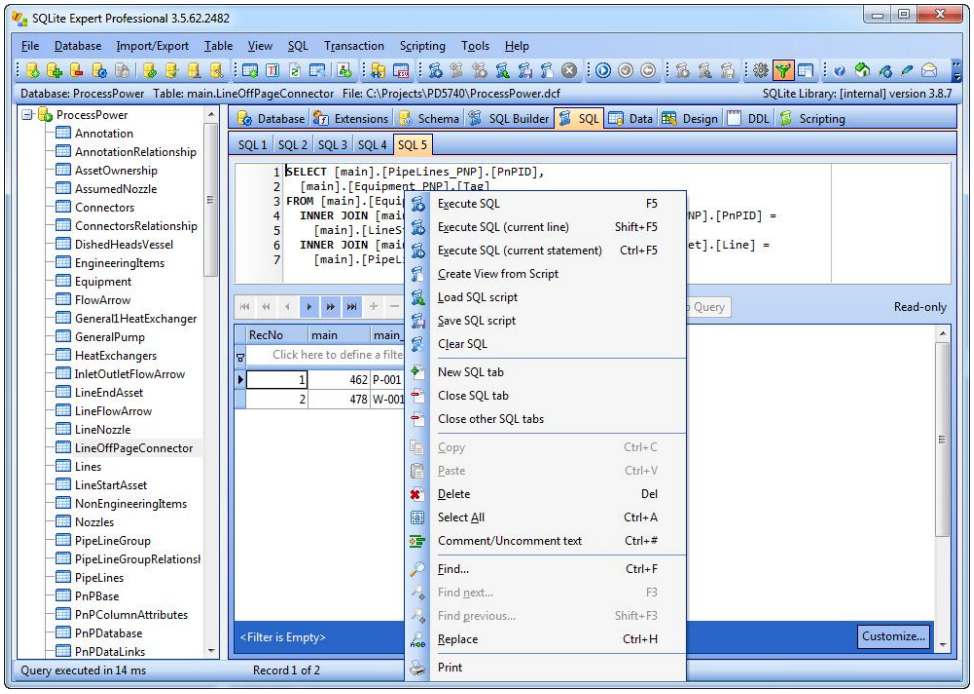
After you click on the SQL Builder you can start drag-and-drop the tables from the right into the middle of your editor. Then you set the relationships between the tables by dragging and dropping one field of table A to the other field of table B.

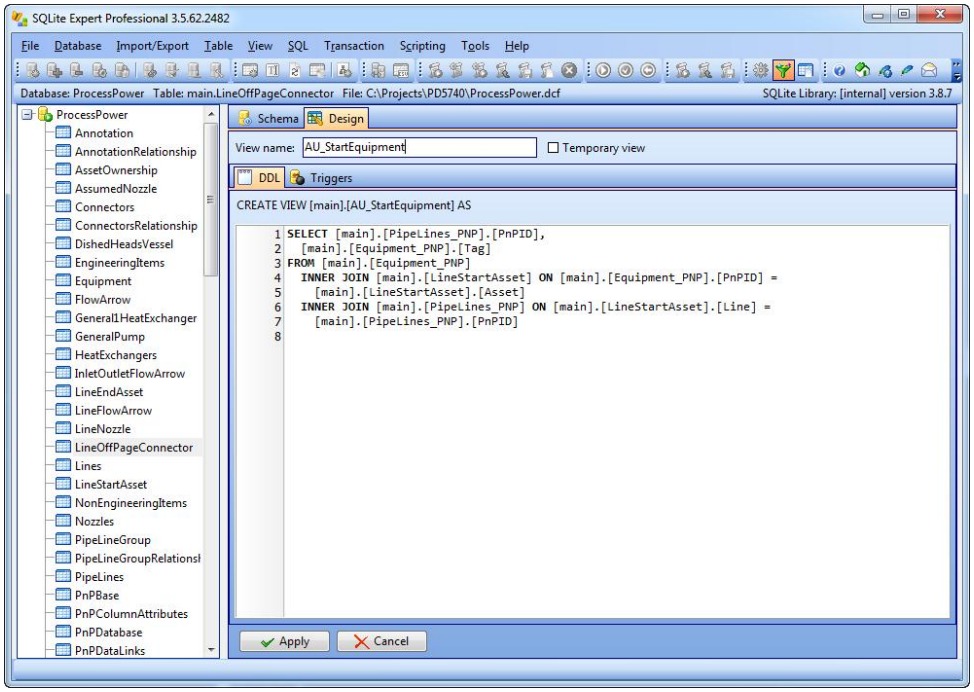


Next you select the fields you need for your view. If you are done you make a right click and select “Build and Execute SQL”. SQLite Expert will show you the SQL statement and the result of the view now. This way you can check if you have all the necessary data that you need for your next step bringing the data into your drawing.



If the result is what you expect you make another right-click and select “Create View from Script”. You can then save the view under the name of your choosing.



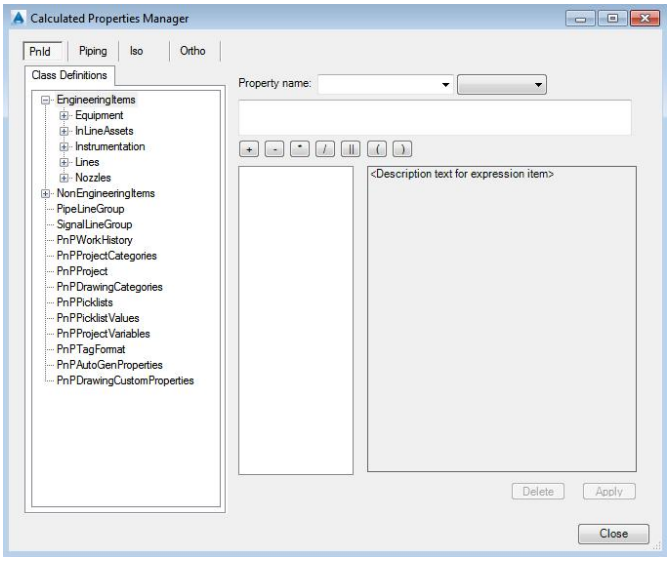


How to get the result of a View into your drawing?

The tricky part now is to bring in the data of the view into your drawing. There is actually no solution provided by Autodesk to import the data of your view into your drawing.

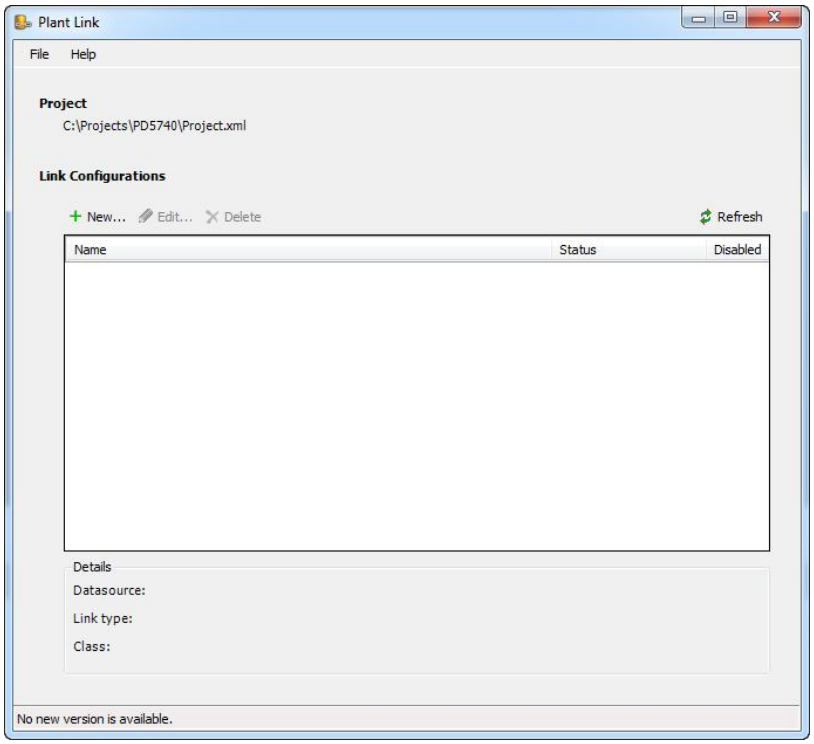
What you can do is export the data with Data Manager and then paste the data from your view into the Excel sheet and import the changes back into your drawing. But this scenario is very limited in what you actually can accomplish when using views.

There is another potential way to import the data by using the PLANTXDBMANAGER. This is an undocumented command of AutoCAD P&ID and AutoCAD Plant 3D. However, PLANTXDBMANAGER allows you to link only to tables. So the view we created cannot be used with that command.

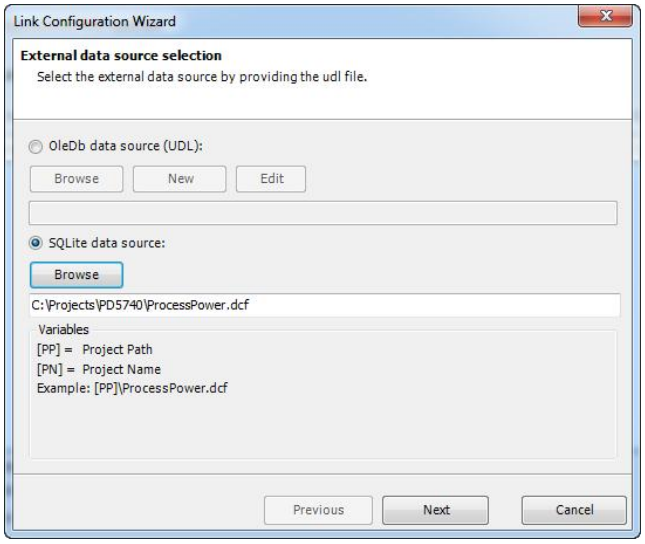


The solution is the use of PlantLink. PlantLink allows linking data from SQLite, SQL Server or Oracle databases.

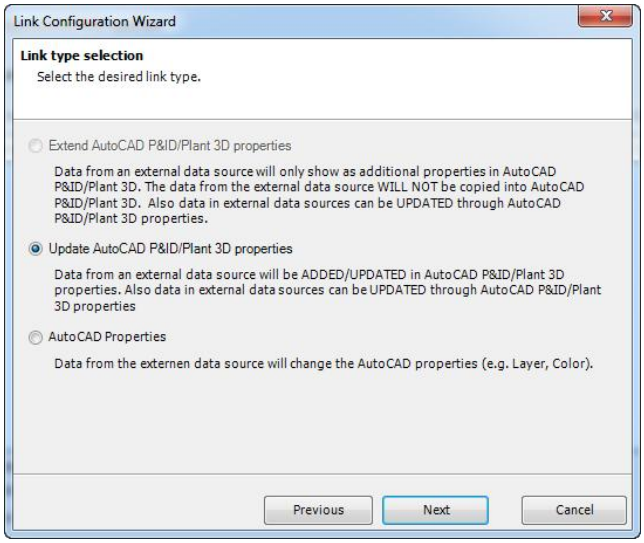
After you clicked on the PlantLink button, the main user interface opens.



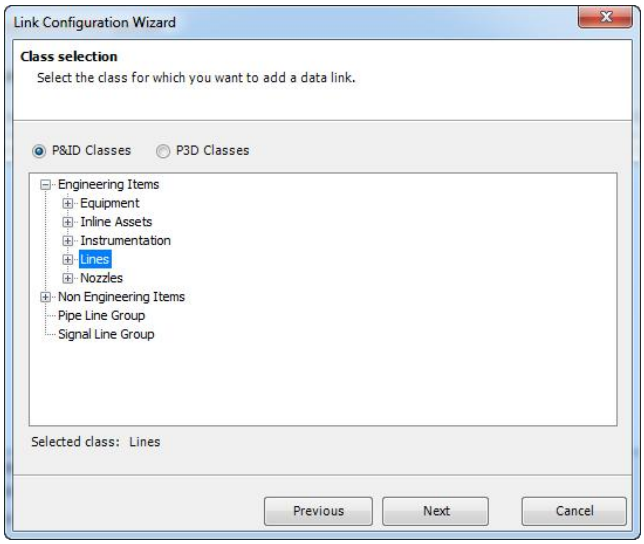
First we click on “New…” To start the wizard of PlantLink. The first thing we need to do is select the database. For this example we select the ProcessPower.DCF file which is the AutoCAD P&ID database.



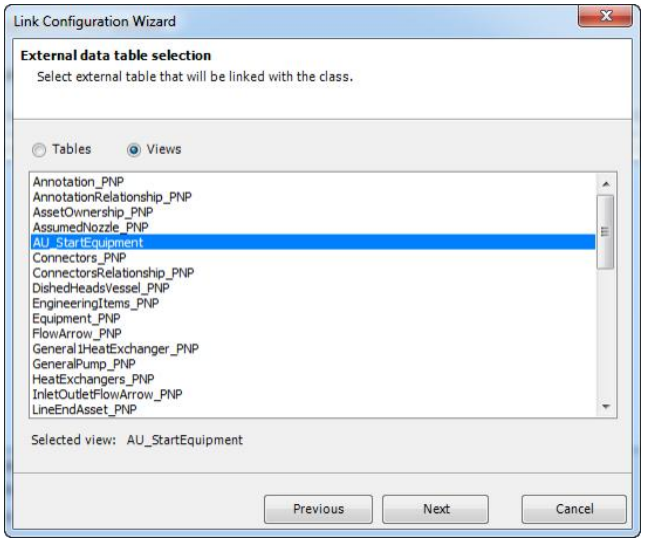
Next we define the type of link configuration we need in our case “Update”. This allows PlantLink to actually bring the data from our view into our properties.



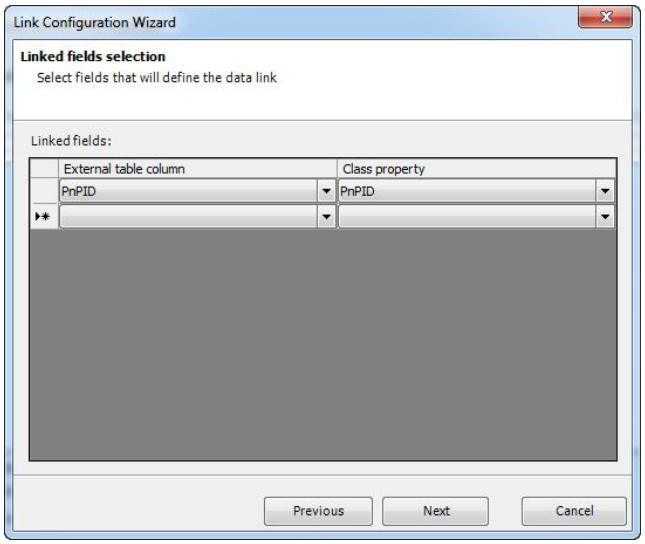
Now we select the class for which we need the values of our view.



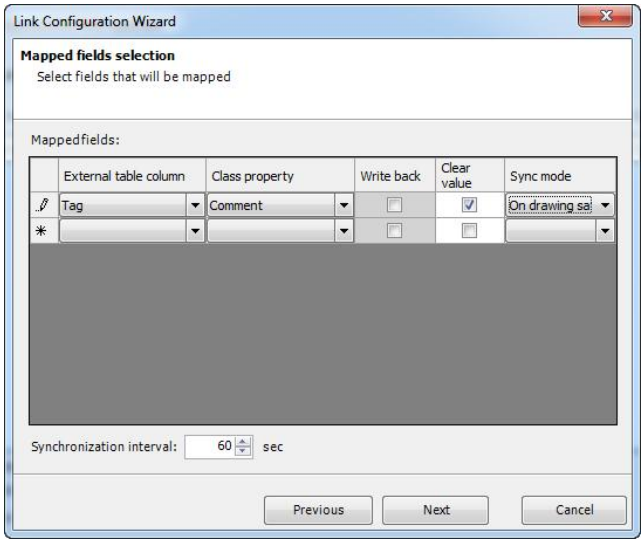
On this page the switch to “Views” and select our view we just created.



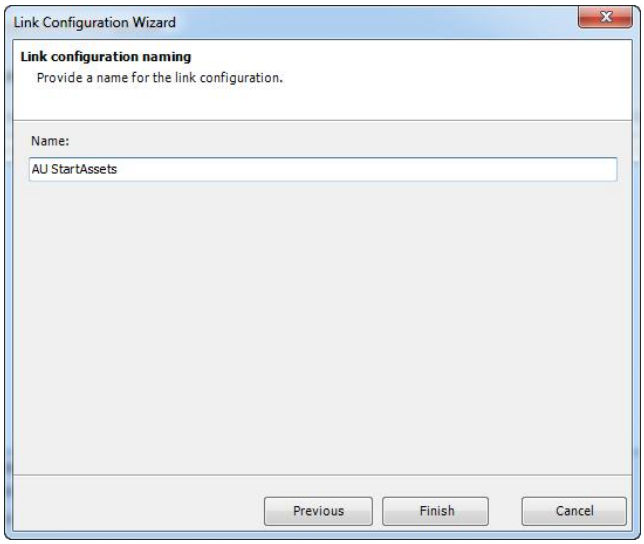
Here we need to define the linked property and the linked column from our view. We select PnPID for both. This way PlantLink can find the correct data set from our view.



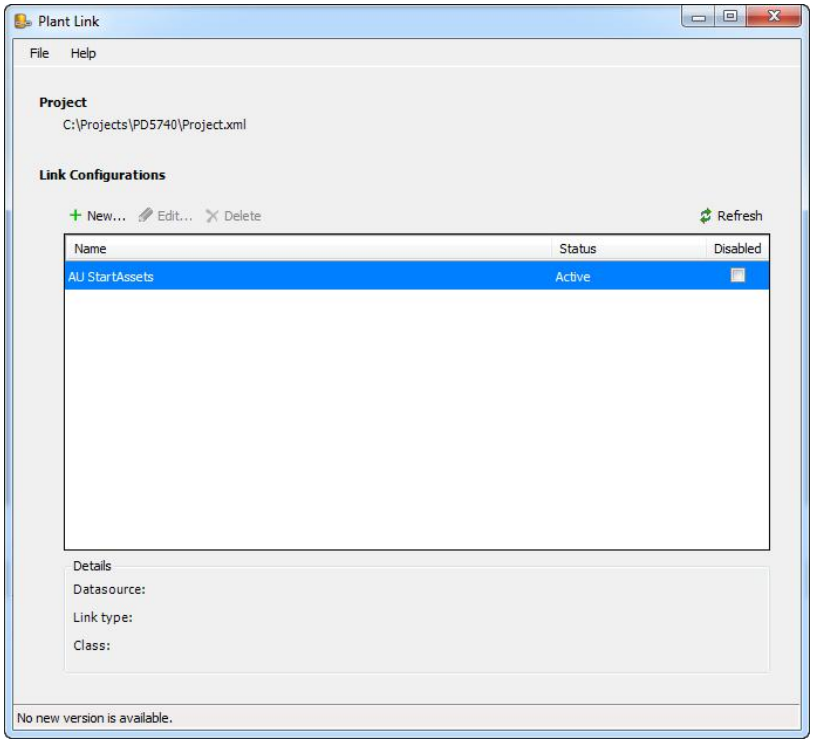
Now use the Tag column of our view and map it to the comment property of P&ID. Also the to “On Drawing Save”.



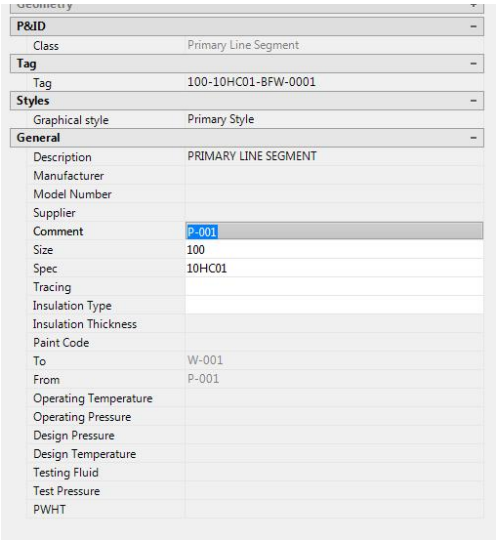
On the last page of the wizard we define the name for our link configuration.



In the main user interface we know see that the link is active and can be used.



If you now safe the drawing, the link will be executed and the Tag of our view can be seen in the comment property of our line.



The example shown in this handout is a very easy one. There are much more complex examples, that allows you for example to have data flow from one instrument bubble to another one of from control valve to an instrument bubble or between lines which are connected by Off-Page connectors.

If you need more in depth examples then have a look at the app store where you can find my book about the AutoCAD P&ID and AutoCAD Plant 3D databases.

https://apps.exchange.autodesk.com/PLNT3D/en/Detail/Index?id=appstore.exchange.autodesk.com%3adatabaseexplained_windows32and64%3aen