# PI Vision: Basics

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# Introduction

In this training you will learn how to use the latest features of AVEVA PI Vision 2022 in order to build extensive, rich, and informative displays. We will be heavily leveraging PI Asset Framework throughout this course in order to showcase the incredible strengths and abilities of the latest release of AVEVA PI Vision. We will investigate new AVEVA PI Vision features by building five main displays and by covering the basic display management and administration tasks.

# Objectives

The following goals will be accomplished upon finishing the lab:

- Understand how to search for important Events, PI Tags, and AF Elements and Attributes using the AVEVA PI Vision Search Pane
- Familiarization with all key features available in AVEVA PI Vision 2022
- Understand the importance and use of each of the eight main symbols. Understand how they can be used to work together in order to display data quickly, easily, and efficiently
- Utilize templates in AF to create one display that may be reused with many different assets
- Be able to perform simple AVEVA PI Vision Administrator tasks

# Your AVEVA PI System

This lab uses a simplified PI system including the PI Data Archive, PI Asset Framework, and AVEVA PI Vision all bundled together on one production server. Each student will have their own client machine to access AVEVA PI Vision remotely. Each client machine is deployed using a Microsoft Azure environment so we will connect to them using Remote Desktop.

The servers of importance are:

- PISRV01
    - AVEVA PI Data Archive 2018 SP3
    - AVEVA PI AF Server 2018 SP3
    - AVEVA PI AF Client 2018 SP3
    - AVEVA PI Vision 2022 Patch 1
    - We will not have direct access to this machine
- PICLIENT01
    - Server to make client connections to AVEVA PI Vision
    - Shortcut to open AVEVA PI Vision is available on Desktop
    - PI ProcessBook 2015 (will not be used in this training)

# Approach

TechCon Labs, LLC has had the PI System for years but has just recently starting using AVEVA PI Vision. So far, they have only used PI Vision as a tool to view Imported PI ProcessBook Diplays.

You have been hired as a consultant by TechCon Labs, LLC to help them get the most value out of their PI System and visualize their data accordingly. TechCon Labs, LLC needs a quick and efficient way to monitor their 60 Wells, 27 Well Pads, and eight Production Areas. They estimate that you'll need to create around 100 displays, and they have allotted two full weeks for the job.

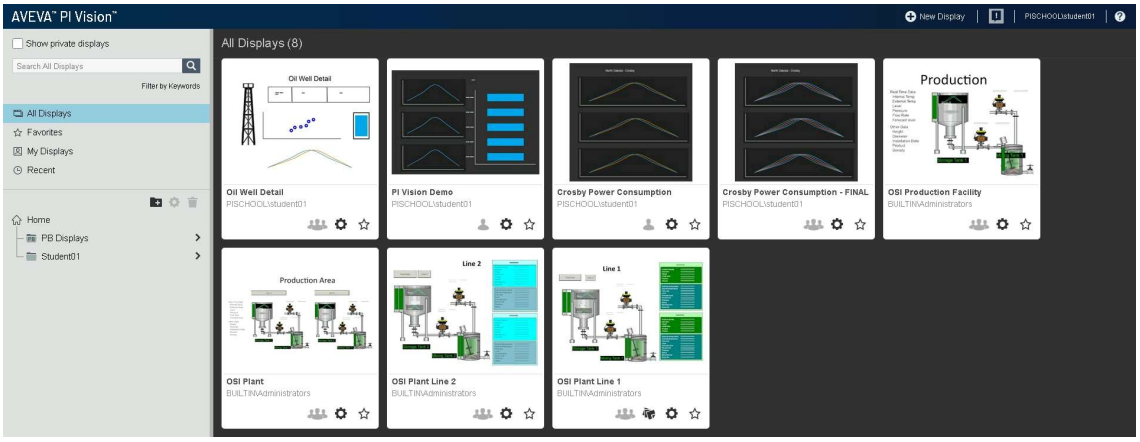
As an expert on PI Vision you will help TechCon Labs, LLC build displays that showcase important events and data within the company. With your in-depth knowledge of PI Vision as well as your comprehensive understanding of element and attribute templates within AF, you know that you'll only need to create 5 displays and that it should take just under three hours to complete.

# AVEVA PI Vision Introduction

TechCon Labs, LLC would like a quick PI Vision introduction before you build all of their displays. Once all of the content is created, they want to make sure that everyone has a general idea of how to navigate PI Vision and create simple ad-hoc displays.

## AVEVA PI Vision Home Page

The home page is the starting point for PI Vision navigation. From here you can create displays as well as browse through your own and public displays:




## AVEVA PI Vision Display Modes

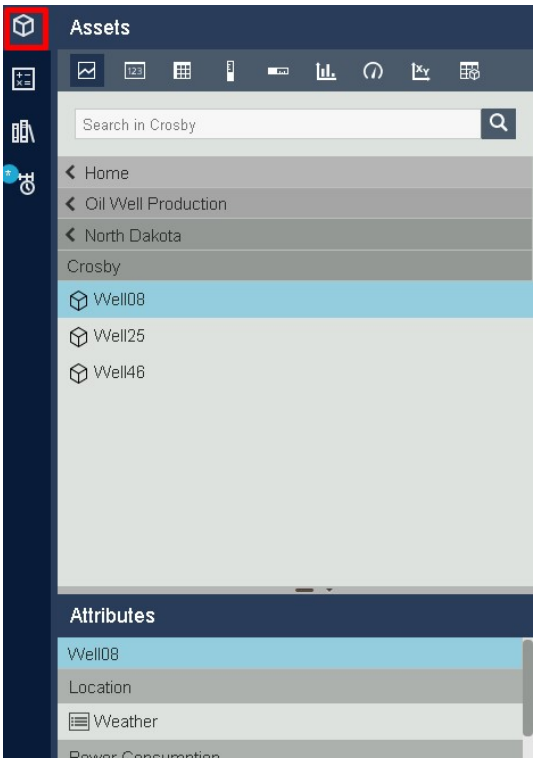
There are two separate modes within PI Vision. You can only build and edit displays while in Design Mode. Look for the ruler and pencil icon in the top right corner of the toolbar. When in Design Mode this icon, as well as the border of the display, will be highlighted in orange:

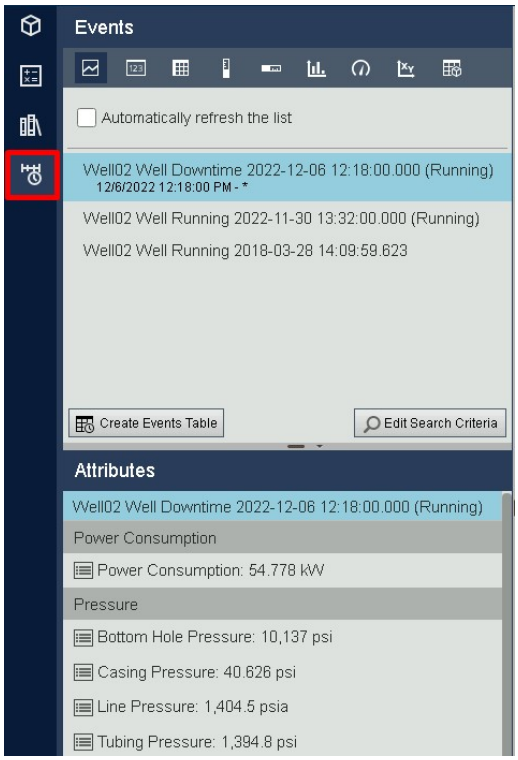
Monitor Operations Mode:

Design Mode:

## Asset Pane & Events Pane

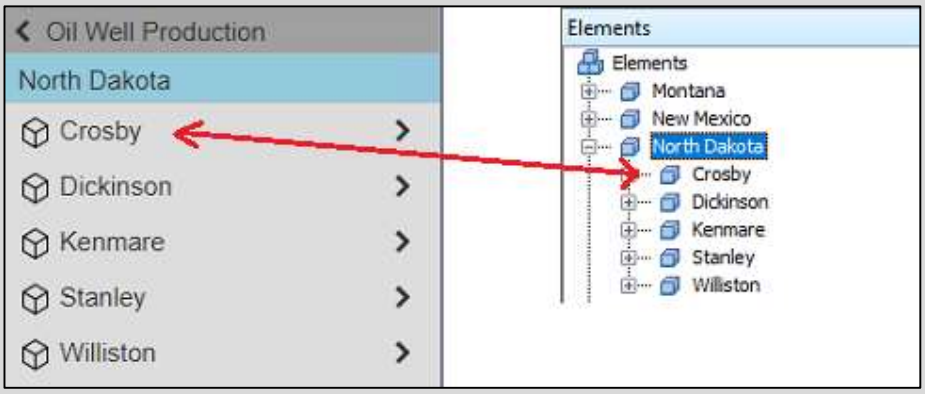
The Asset Pane is used to find AF Elements and Assets as well as PI Points. AF Attributes can be found in the Attributes section. If the particular asset you are working with has related events they will be populated in the Events Pane:




**Note:**

In this lab we will be working with the Oil Well Production AF Database on the PISRV01 AF Server. The Assets viewable in the PI Vision Search Pane are AF Elements created with PI System Explorer. The AF Structure has been built prior to beginning work on the PI Vision displays, which is recommended in order to take advantage of PI Vision's most powerful features.

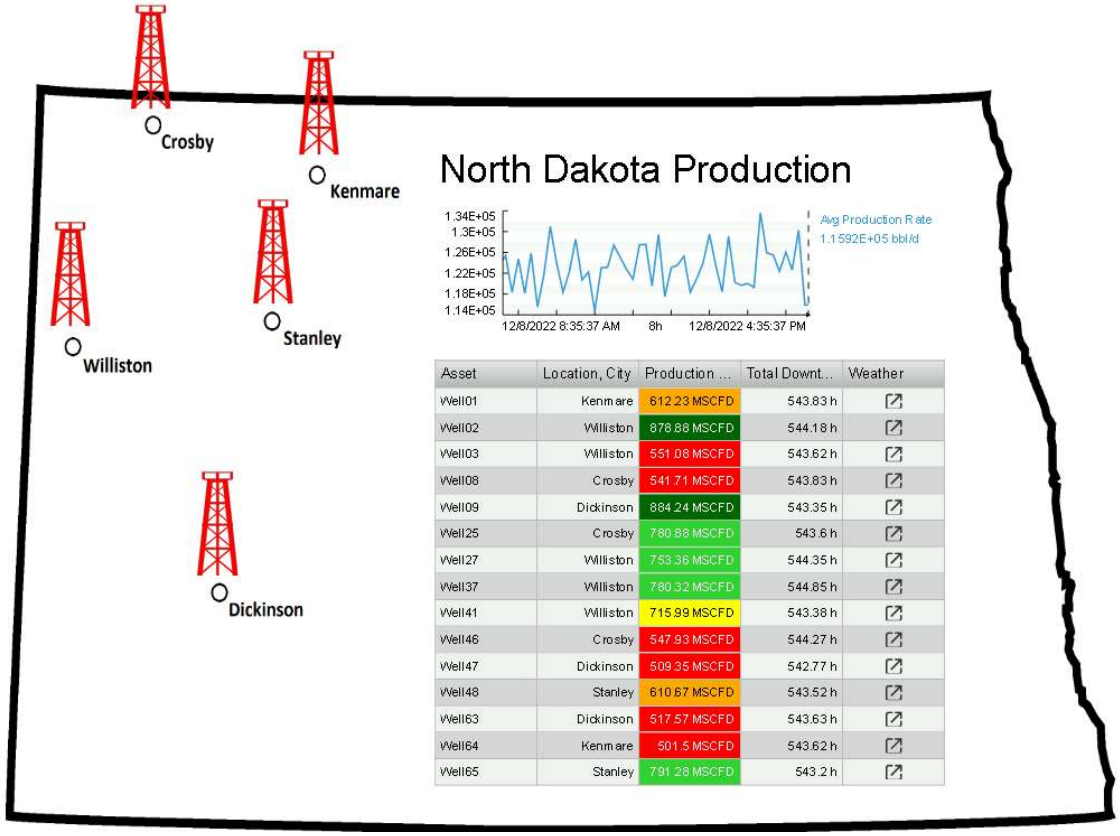



Each element can have its own set of permissions, which is also enforced within PI Vision.

# Challenge 1: Create an Overview Display

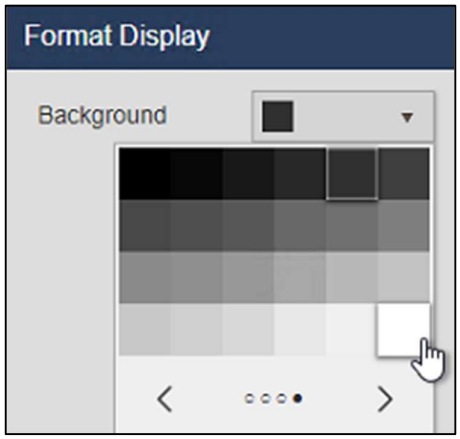
TechCon Labs has identified production within the state of North Dakota as a strategic area to monitor in the next several months. The TechCon Labs management team has requested a dashboard from which they can see any under-performing Well Pads or Oil Wells within the state at a single glance. If management is impressed by the resulting dashboard, they plan to approve additional project resources to continue the project.

Below, the team has provided an illustration of what they would like this overview display to look like:



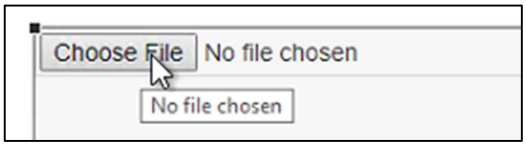
## 1.1: Prepare the Display

1. On the PI Vision Homepage, click the **New Display** button at the top right-hand side of the screen.
2. Right-click anywhere on the background of the display and select **Format Display…** to open up the configuration pane.
3. Open the **Background** drop-down color selector and choose the white background:



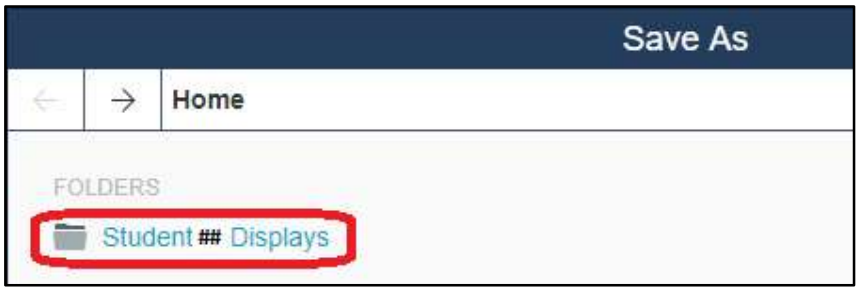

4. Click the **Image** button on the toolbar:

5. Click and drag to outline most of the display area, and then click **Choose File**:




6. Select the file **C:\Class Files\north_dakota.gif** from the file explorer. If you do not see the image in this folder, please let your instructor know.
7. Click on the **Save** button in the top right of the browser window:

8. Select the Display Folder for your user account:




9. Save the display with the name **North Dakota Overview** followed by your initials. For example: *North Dakota Overview_<your initials>*
10. Click the **Design button** (ruler and pencil) to place the display back into Design Mode:

**Note:**

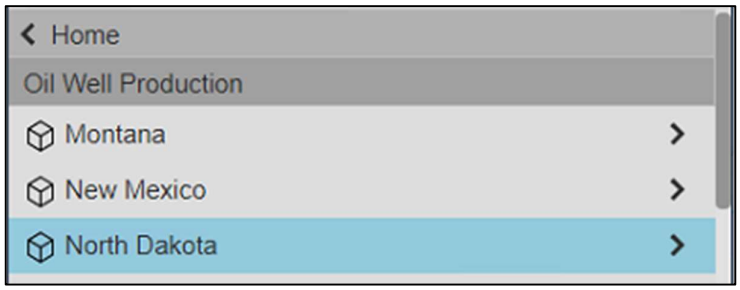
The workbook does not explicitly call for the display to be saved again until it is completely finished.
However, it is a good idea to make incremental saves after every couple steps to make sure no work is ever lost. This can be done at any time by clicking the **Save** button again.

11. Click the **Text** button on the toolbar:

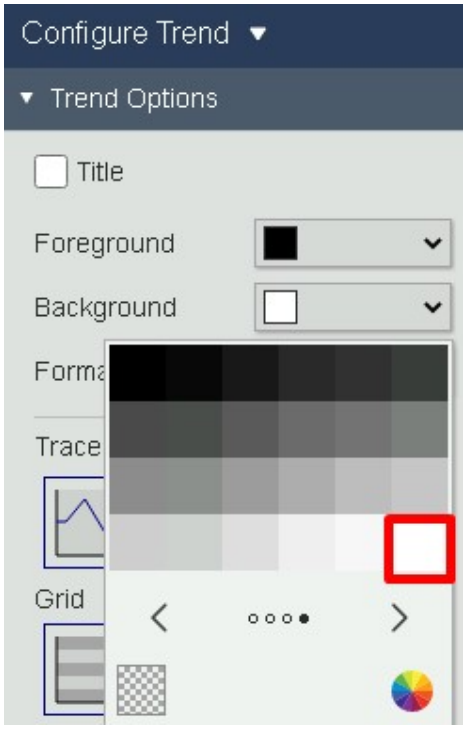
12. Click on the upper right area of the state image and type “North Dakota Production” in the **Format Text** field of Configuration Pane.
13. In the same Configuration Pane, set the **Font Size** to 28.

## 1.2: Add PI Data

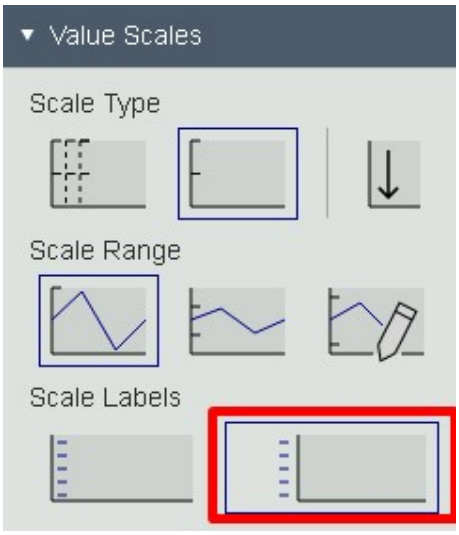
1. In the Asset Pane to the left of the display workspace, find the **Oil Well Production** database and click on the rightmost "**>**" to drill down into the database. On the first level of the database, find and click on the **North Dakota** element. If the Asset Pane is collapsed, click on the **Assets** icon to expand it (see Asset Pane & Events Pane section for a refresher).



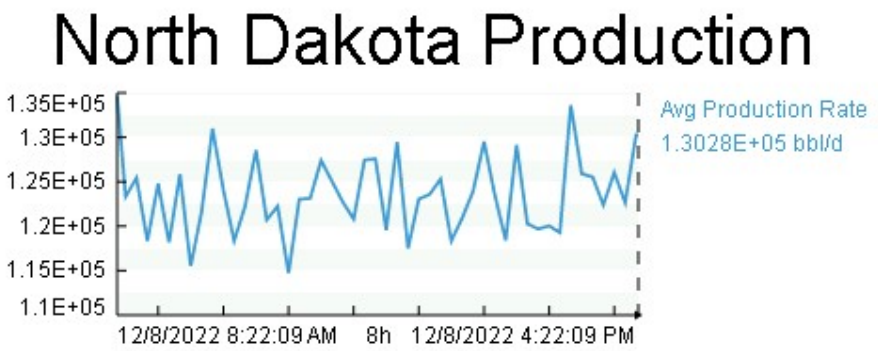

2. Verify the Trend symbol type is highlighted, and click and drag the **Avg Production Rate** attribute on the display to fill the area below the text symbol that reads "North Dakota Production".
3. Right-click on the symbol and select **Configure Trend**.
4. Change the **Background** from very light grey to white




5. Select to show the Scale Labels outside plot area:

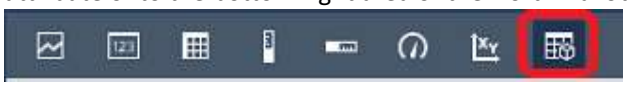



6. Resize the trend to only occupy a narrow band below the display title in the top right corner of the North Dakota outline:

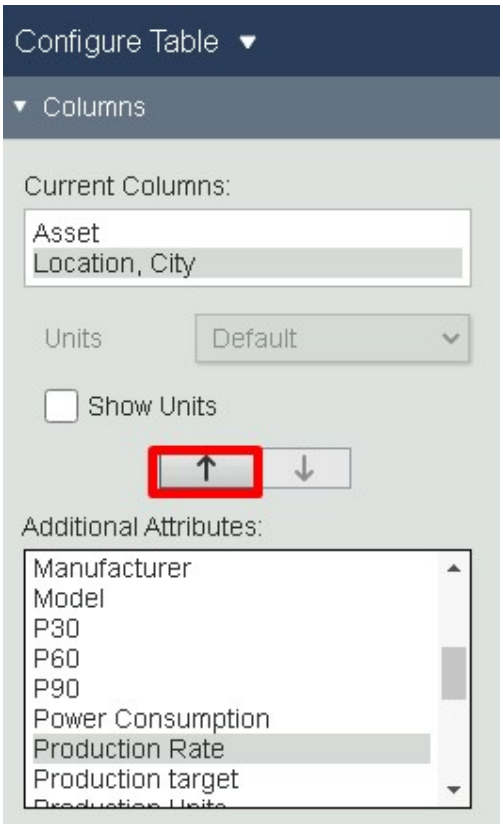



7. Drill down into the **North Dakota** and **Crosby** elements in the Asset Pane to find **Well08** and click on it.
8. Below the Asset Pane under **Attributes**, find the **Location, City** attribute:

9. Select the **Asset Comparison Table** symbol and then click and drag the **Location, City** attribute onto the bottom right area of the North Dakota state outline on the display:

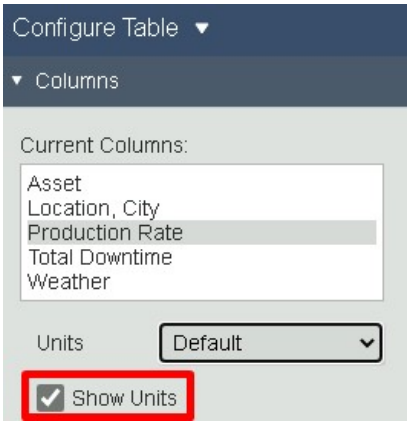


10. Right-click on the table symbol and select **Configure Table…**
11. Under **Additional Attributes**, select **Production Rate** and click the upwards pointing arrow to add an additional attribute column:




12. Repeat the previous step (11) for the **Total Downtime** and **Weather** attributes to add a fourth and fifth attribute column to the table.
13. In the **Style** section of the configuration pane, select the middle option to use a light color scheme

14. Resize the symbol area and the table columns so that no text is cut off either in the column headers or in the data cells.
15. In the configuration pane, highlight the **Production Rate** column and click the **Show Units** checkbox:

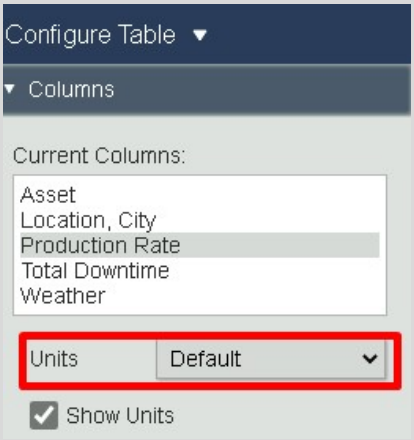


16. Repeat the previous step (15) to show units for the **Total Downtime** attribute column as well.

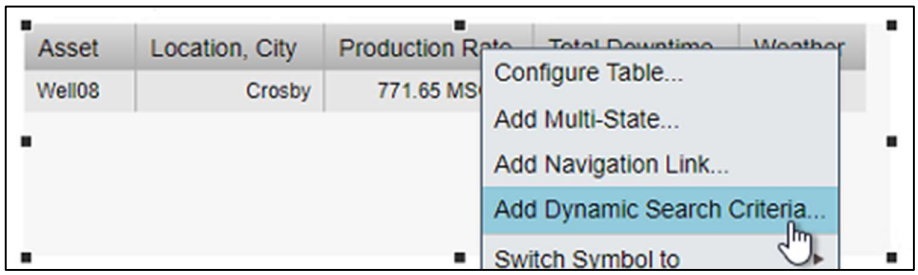
**Note**:

Starting on **PI Vision 2022**, **Unit of Measure (UOM)** can be switched on a data item and symbol basis. A user is able to view AF attributes and asset-based AVEVA PI Vision calculations values in the UOM that is most applicable to their region and/or preferences.

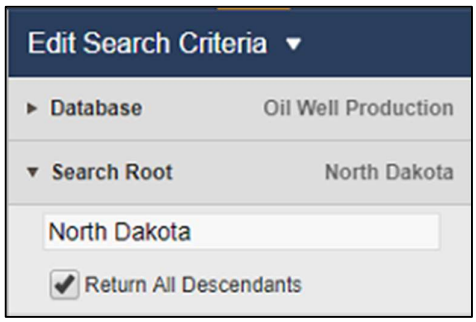
To switch from one UOM to another simply access the symbol configuration panel, under Style section select the appropriate UOM at the Units option.




17. Right click on the Asset Comparison Table symbol and select **Add Dynamic Search Criteria…**




18. Modify the **Search Root** to include all of North Dakota and click the checkbox to **Return All Descendants**. Then, click **Refresh:**



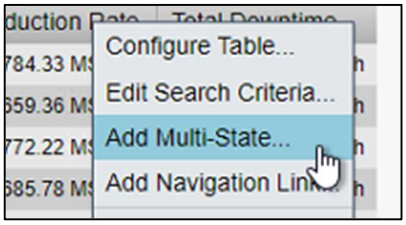

19. Resize the symbol again so that all rows are shown and there are no scroll bars.

**Note**:

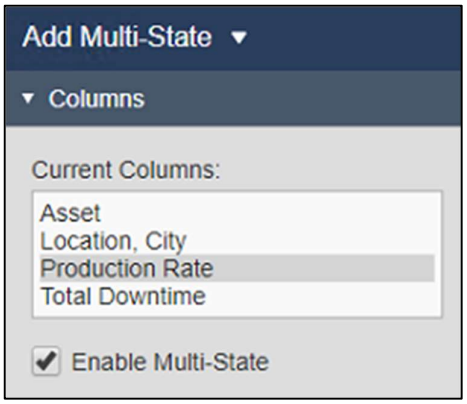
The icons in the **Weather** column can be clicked to open a link containing weather information for the appropriate city. Behind the scenes, this is an AF Attribute that contains a URL as its value.

## 1.3: Configure Multi-Stating

1. Right-click on the Asset Comparison Table symbol and select **Add Multi-State…**:



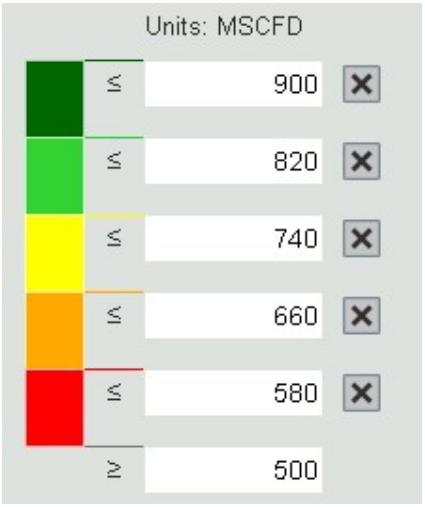

2. In the Configuration Pane, select **Production Rate** and select **Enable Multi-State**:




**Note**:

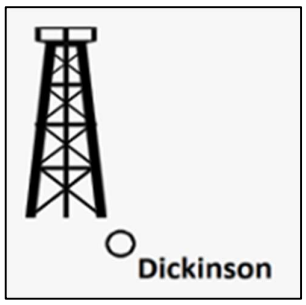
You may notice this checkbox is grayed-out in some of the other columns. This is because attributes must contain numeric values or be configured with digital states to be eligible for Multi-Stating.

3. Modify the State colors so low values are shown in red and high values in green with a color gradient in between:




4. On the left-hand side of the display, open the Graphic Library locate the **Plant Facilities** section. Select the **Oil Well** graphic:

5. Draw the **Oil Well** graphic next to **Dickinson** on the map:




6. Right-click on the graphic and select **Configure Multi-State…**
7. Drill down into the **North Dakota** element in the Asset Pane and highlight **Dickinson**.
8. Click and drag the **Avg Production Rate** attribute under the **Multi-State Attribute** header in the rightmost configuration pane.
9. Repeat step 3 to modify the State colors so low values show in red and high values in green.
10. Select the **Oil Rig** graphic on the display and click **Copy** on the toolbar

11. Click **Paste** four times

**Note**:

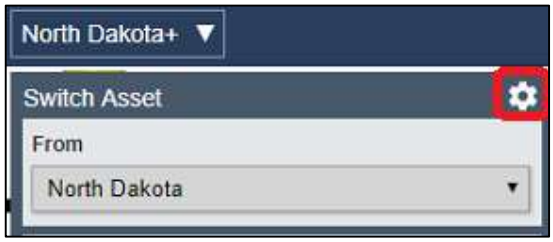
The keyboard shortcuts ***Ctrl + C*** and ***Ctrl + V*** may also be used to copy and paste, respectively.

12. Click and drag the four new **Oil Well** graphics so there is one next to each production area
13. Repeat steps 6-9 to replace the Multi-state Attribute with the **Avg Production Rate** for the corresponding production area (**Crosby|Avg Production Rate**, **Kenmare|Avg Production Rate**, etc).

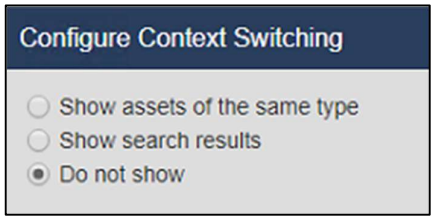
**Note**:

Be sure to replace the Multi-State data item rather than removing the existing item (using the trashcan graphic) and adding the new one. If the item is removed, the Multi-State colors will need to be re-configured each time.

14. Open the Asset drop-down menu on the top of the display and then click the configure button




15. Under **Configure Context Switching** in the configuration pane, select **Do not show:**




**Note**:

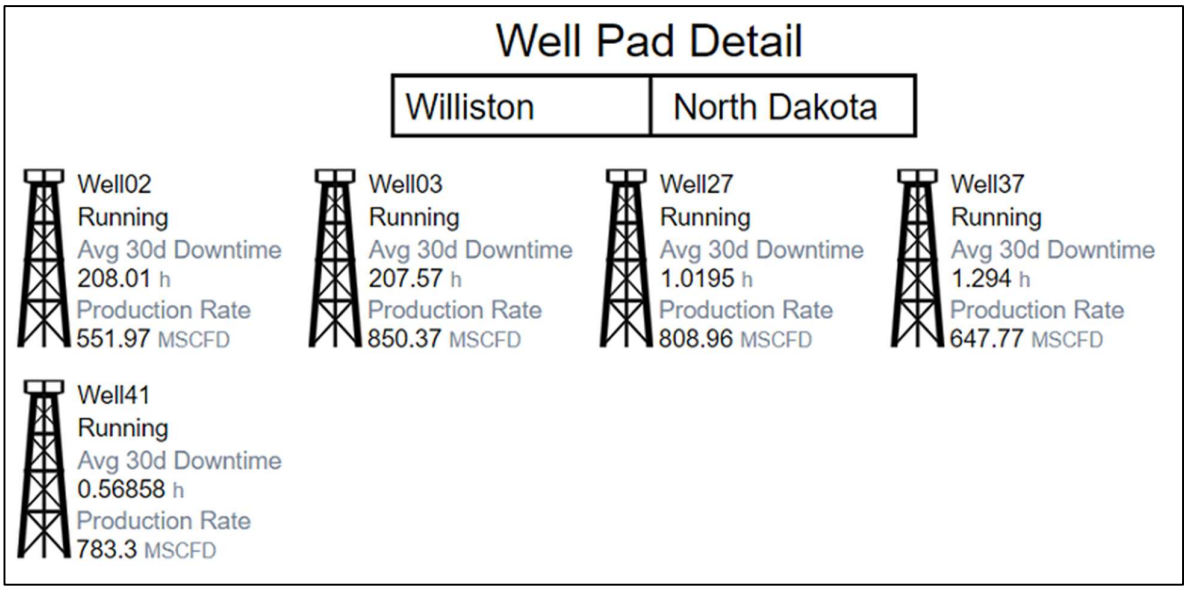
Since this is an overview display, we are hiding the context switching menu. This display is designed to always show the same data items. We will later be creating other displays that are meant to have a swappable asset context, and therefore will have the menu enabled.

16. In the top right corner, click the **Save** button:

# Challenge 2: Create a Well Pad Drill-in Display

The TechCon Labs management team has taken a look at the North Dakota dashboard and they think this PI Vision project has potential. However, they would also like to have a more detailed dashboard for each well pad.

Below, the team has provided an illustration of what they would like these well pad displays to look like:




Since there are five different production areas and each one has a variable number of oil rigs, the executive team has allotted a week to build a specialized display for each area. However, because you are familiar with the latest *collection* and *asset-relative* functionality in PI Vision, you believe you can satisfy the design requirements with a single display.

## 2.1: Prepare the Display

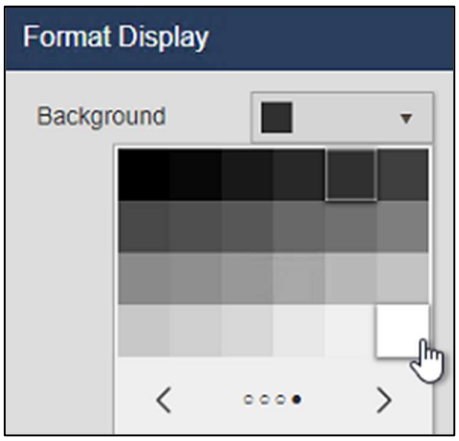
1. On the PI Vision home page, click the **New Display** button at the top right-hand side of the screen

**Note**:

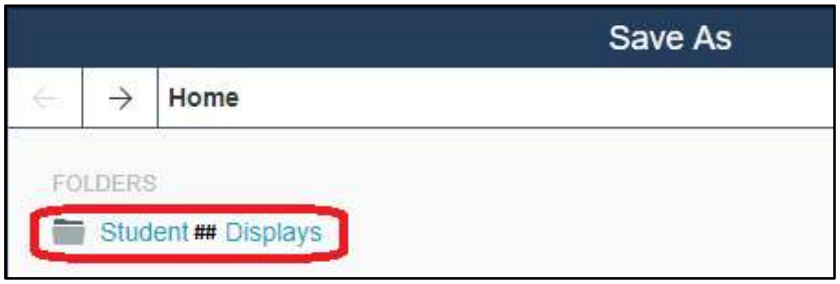
At any time, you may return to the PI Vision home page by clicking on the *PI Vision* logo in the top left of the page. But please remember to save the display you are currently working on as any unsaved changes will be lost.

AVEVA™ PI Vision™

2. Right-click anywhere on the background of the display and select **Format Display** to open up the configuration pane.
3. Change the display **Background** color from the default dark gray to white:




4. Highlight the **Text** button on the toolbar and then click on the top middle area of the display and type "Well Pad Detail" under the **Format Text** header in the configuration pane.
5. In the same Configuration Pane, set the **Font Size** to 26.
6. Click on the **Save** button in the top right of the browser window.
7. If it is not already selected, click on the Display Folder for your user account

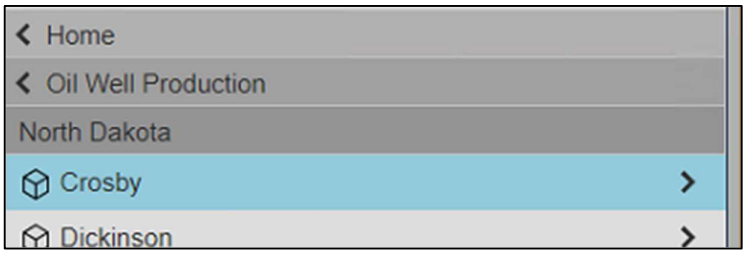



8. Save the display with the name **Well Pad Detail** followed by your initials. For example: *Well Pad Detail_<your initials>*.

## 2.2: Add PI Data for the Well Pad

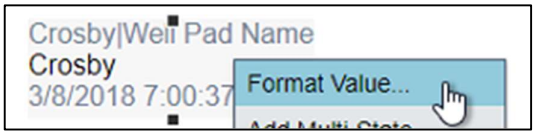
1. Click the **Design button** to place the display back into Design Mode

2. Drill down into the **North Dakota** element under the **Oil Well Production** database in the Asset Pane and find the **Crosby** element:

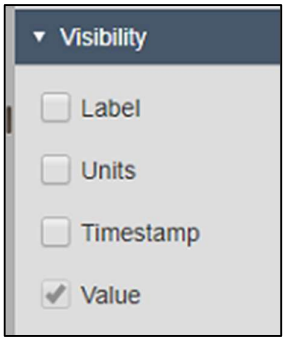



3. Select the **Value** symbol type at the top of the search pane:

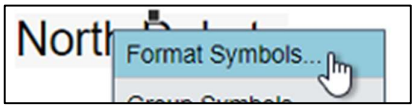
4. Click on the **Well Pad Name** attribute and drag it onto the display below the "Well Pad Detail" text symbol.
5. Right-click on the value symbol and select **Format Value…**




6. Expand the **Visibility** section of the configuration pane and deselect **Label**, **Units**, and **Timestamp**. We only want to display the name of this well pad:




7. With the **Value** symbol still highlighted, click on the **Production Area Name** attribute and drag it onto the display below the "Well Pad Detail" text symbol and to the right of the well pad name.
8. Right-click on the value symbol and select **Format Value…**
9. Repeat step 6 to remove the **Label**, **Units**, and **Timestamp** from the **Production Area Name**.
10. Select both Value symbols by holding the **Ctrl** key and clicking on each in turn.
11. Right-click on either of the symbols and select **Format Symbols…**:

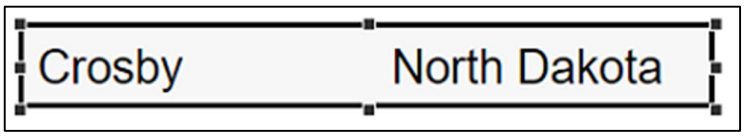



12. In the Configuration Pane, set the **Font Size** of both symbols to 20.

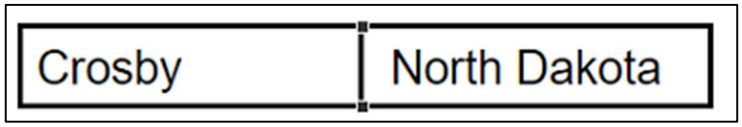
13. With both value symbols still selected, click the **Align Top** option in the **Arrange** dropdown menu on the toolbar. This will adjust the vertical positions of all currently selected symbols to align to the top of the topmost symbol in the selected group:

14. From the **Shape** dropdown menu on the toolbar, select the **Rectangle**:

15. With the rectangle shape selected, click and drag on the display to draw a rectangle around the two existing Value symbols.
16. In the **Arrange** dropdown menu, select **Send to Back** to move the rectangle underneath the two Value symbols:




17. Expand the **Shape** dropdown menu on the toolbar and select the **Line**.
18. While holding down **Shift**, trace a line to divide the rectangle into two sections containing one value symbol each:

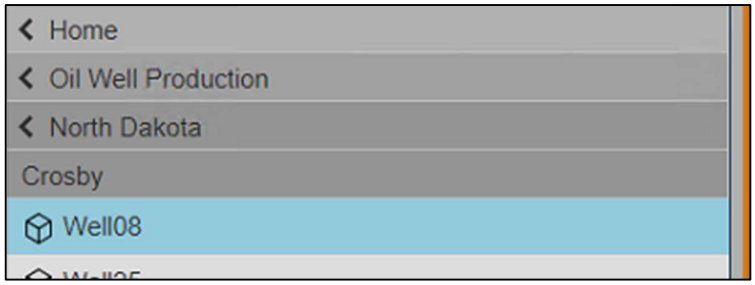



**Note**:

Holding down **Shift** while drawing will cause the **Line** shape to "snap" to the closest 45° angle.

## 2.3: Add PI Data for the Well Pad's Wells

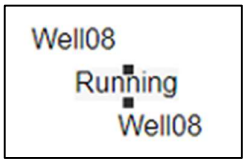
1. Drill down into the **North Dakota** and **Crosby** elements under the **Oil Well Production** database in the Asset Pane and find the **Well08** element:



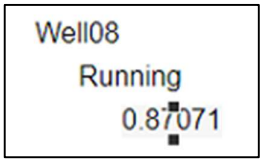

2. Verify the **Value** symbol is still selected:

3. Find the **Well Name** attribute and drag it onto the display.
4. Right-click and **Format** [this] **Value…** to deselect the **Label**, **Units**, and **Timestamp** options underneath the **Visibility** section of the configuration pane (see 2.2, steps 5-6 for a refresher).

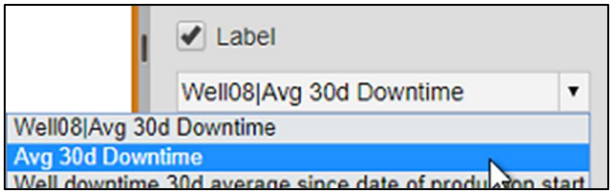
5. **Copy** this symbol and **Paste** it two times.
6. Find the **Status Message** attribute underneath **Well08** in the Asset Pane. Drag it onto the second **Well08** Value symbol. The second Value symbol should now read the status message rather than the well name:




7. Find the **Avg 30d Downtime** attribute underneath Well08 in the Asset Pane and drag it onto the third **Well08** Value symbol:

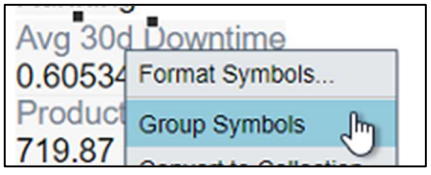



8. Right-click on the third value symbol and select **Format Value.**
9. In the **Visibility** section, check the boxes for **Units** and **Label**. Using the drop-down menu, select the second label instance (where it only includes the name of the attribute and not the name of the element):

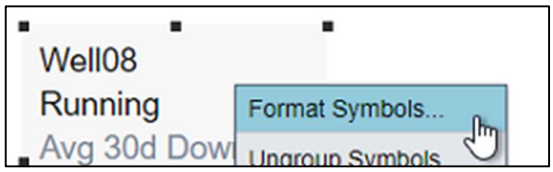



10. **Copy** the **Avg 30d Downtime** Value symbol and **Paste** it one time.
11. Click and drag the fourth value symbols so there is no overlap

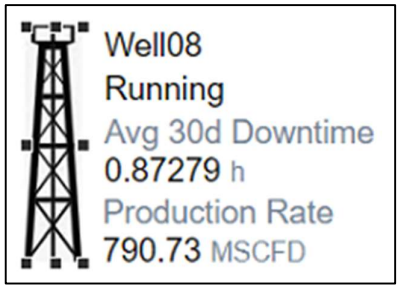
12. Find the **Production Rate** attribute and drag it onto the newly created fourth Value symbol.
13. Click and drag a selection box around the value symbols to select all four simultaneously.
14. From the **Arrange** dropdown menu, select **Align Left**. This will horizontally adjust the position of all currently selected symbols to align with the leftmost symbol in the selected group.
15. With all four of the symbols still selected, right-click any one of the symbols and select the **Group Symbols** option:




16. Right-click on any of the four symbols again and select **Format Symbols…**

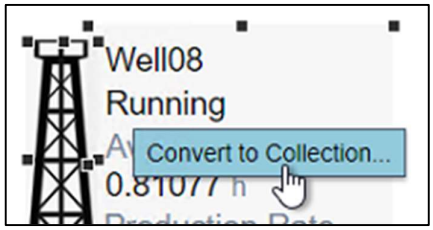



17. Set the **Font Size** to 14
18. On the left-hand side of the display, open the **Graphic Library**, find the **Plant Facilities** section, and select the **Oil Well** graphic from Challenge 1.
19. Draw the **Oil Well** graphic right next to the four values symbols that were most recently added

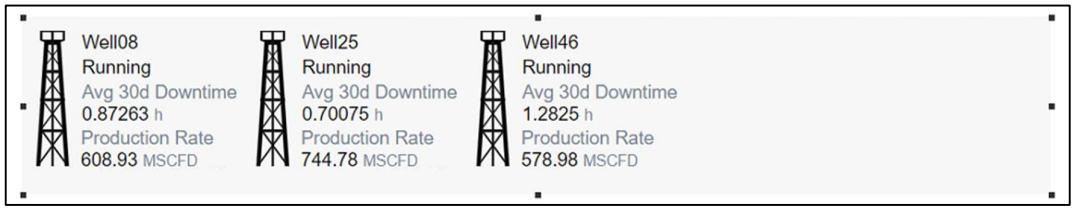



## 2.4: Create a Collection

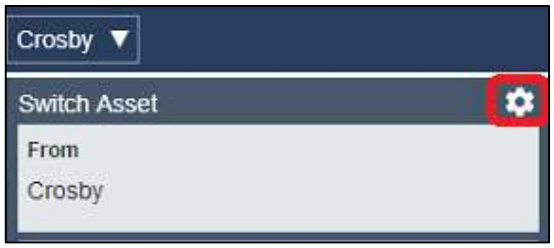
1. Select all of the Value symbols created in the previous section including the **Oil Well** graphic, right-click on any one of those items, and select the **Convert to Collection…** context option:



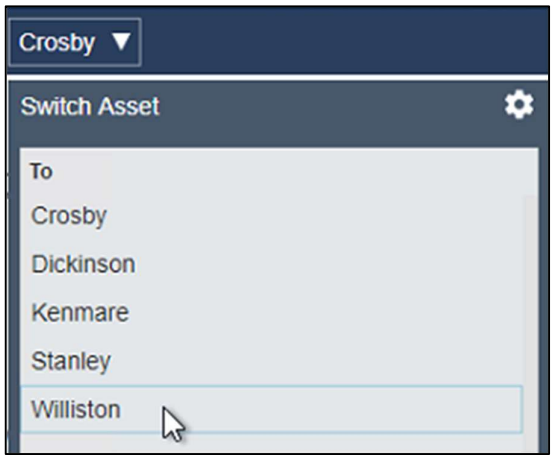

2. Resize the collection area so that all Oil Wells can be show in a horizontal row




3. Open the Asset drop-down menu on the top of the display and then click the configure button




4. Toggle the **Context Switching** option to use **Show search results** and verify that the North Dakota element is set as the **Search Root**.
5. Open the Asset Dropdown menu and click **Williston** to change the display context



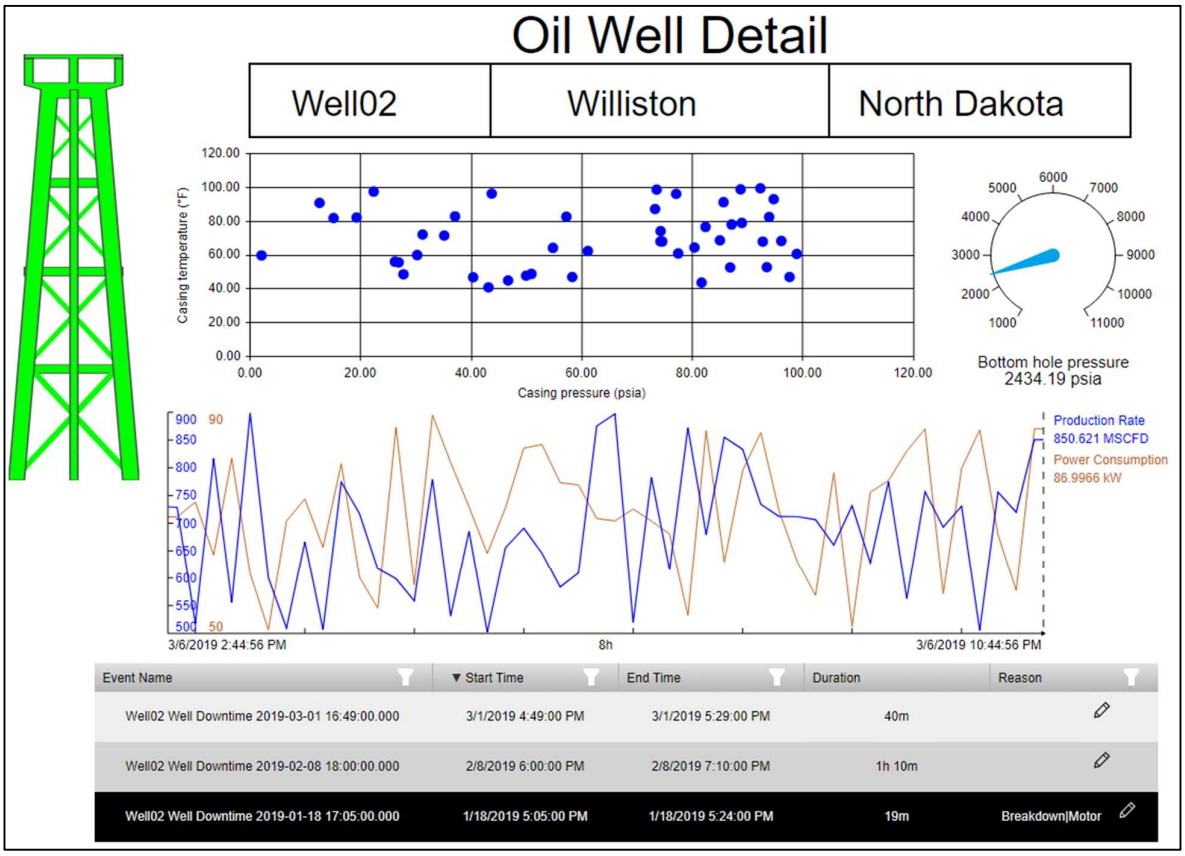

6. Save the display.

# Challenge 3: Modify an Existing Oil Well Display

The TechCon Labs management team is again satisfied with your work and would like to take this a step further. This time they have requested a dashboard for each oil well within North Dakota. There is an existing PI ProcessBook display that served this purpose before and should be used as a model. In addition to the items on that display, the dashboard must also include a way to view and classify recent downtime events for the oil rig.

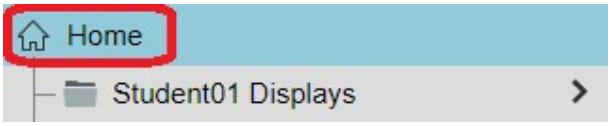
Management was surprised by the quick turnaround on the last stage of the project, but they still figure so many displays will take at least a week to build. With your experience building the previous two displays, you are confident that only a single display is needed here. To make matters easier, a colleague of yours has already migrated the PI ProcessBook display into PI Vision. But they forgot to transfer ownership of the display to you before they left for vacation! As a result, you'll need to find this migrated display and create a copy that you can adapt for downtime event analysis.

With your additions to the original display, the management team expects this display to look something like the following:



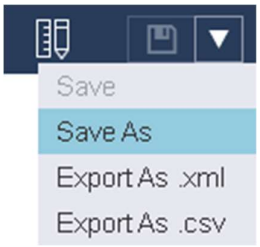
## 3.1: Find and Copy the Migrated PI ProcessBook Display

1. Click on the PI Vision icon in the top-left of the browser window to return to the display homepage.
2. Navigate to the Home folder at the top of the display folder navigation tree:

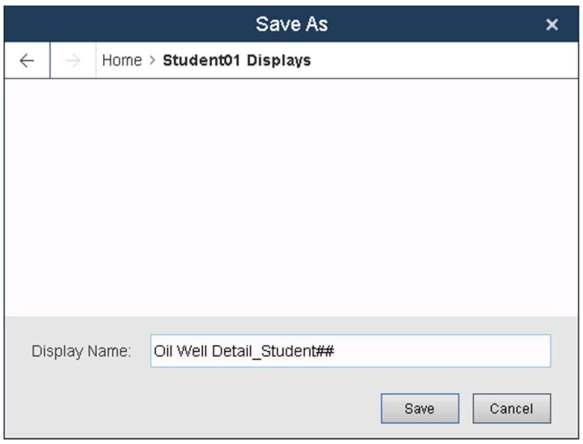



3. Find and open the display named **Oil Well Detail** located here.
4. In the top-left corner of the display, you should see the words "read-only" next to the display name. No changes may be made to this copy of the display. Instead, an editable copy must be made:

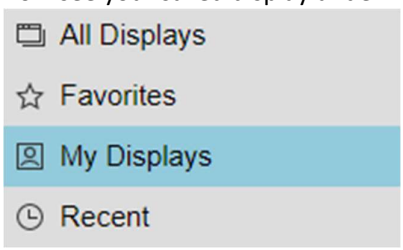
5. In the top-right corner of the display, click the dropdown next to the Save button and select **Save As**:




6. Name the display something like **Oil Well Detail_*<your initials>*** and save it to your display folder:



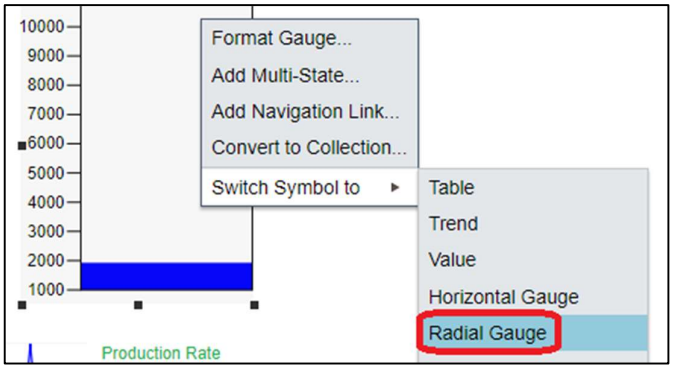

7. You are now the owner of an editable copy of this display. To further show this, you should now see your saved display under **My Displays**:



## 3.2: Modernize Gauge Symbol and Update XY Plot

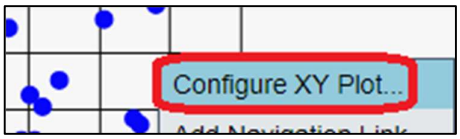
1. Click on the **Design button** in the top right corner of the window to switch to Design Mode

2. Right-click on the Vertical Gauge and select **Switch Symbol to Radial Gauge**

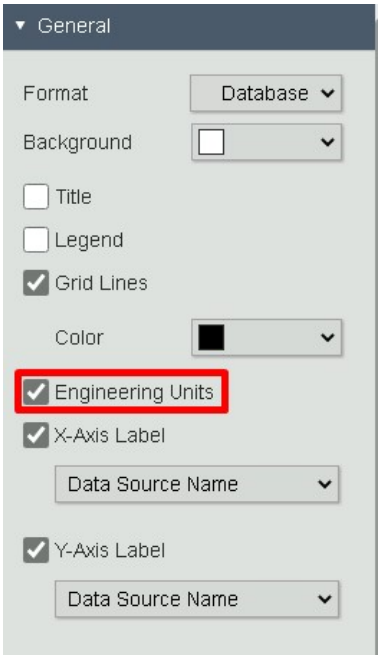



3. Right-click on the symbol and select **Format Gauge…** In the Visibility section, use the **Label** dropdown menu and select to show only the attribute name:

4. Right-click on the XY Plot and select **Configure XY Plot…**



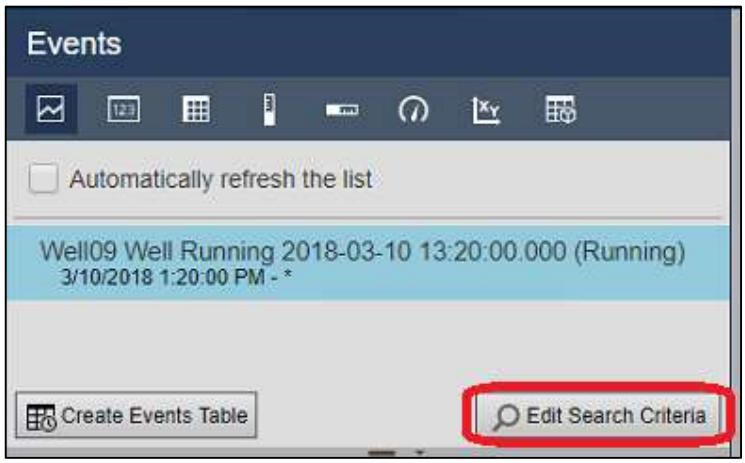

5. In the General section of the Configuration Pane, enable **Engineering Units**



## 3.3: Introduce Downtime Event Tracking

1. Open the Events Pane beneath the Asset Pane on the left-hand side PI Vision:

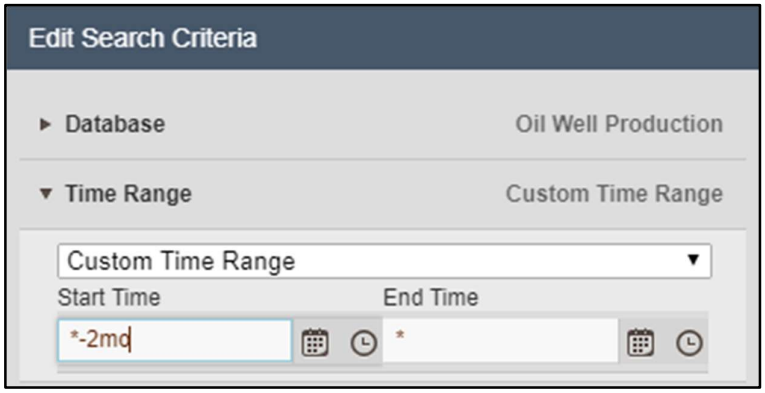
2. Click **Edit Search Criteria**:



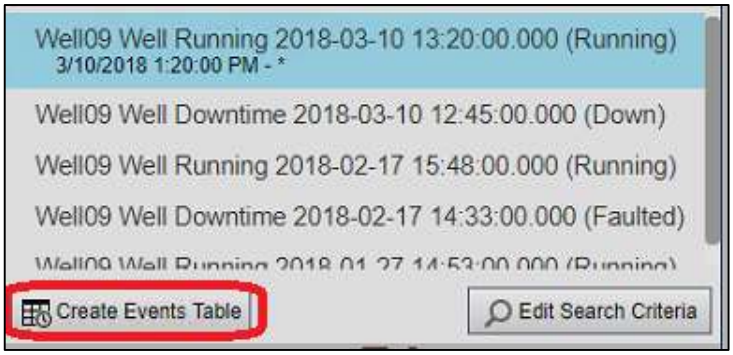

**Note:**

By default, the Events Pane returns events active at any point between start and end time of the display and related to any assets currently on the display.

3. Select **Custom Time Range** from the Time Range dropdown list, specify "*-2mo" (two months ago) as the Start Time, and click Apply to save the changes:

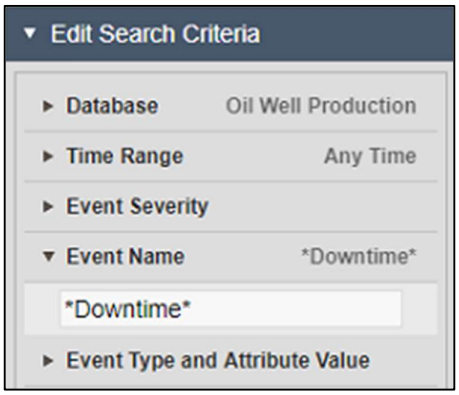


4. Click **Create Events Table** and drag the resulting symbol beneath the Production Rate vs Power Consumption trend:

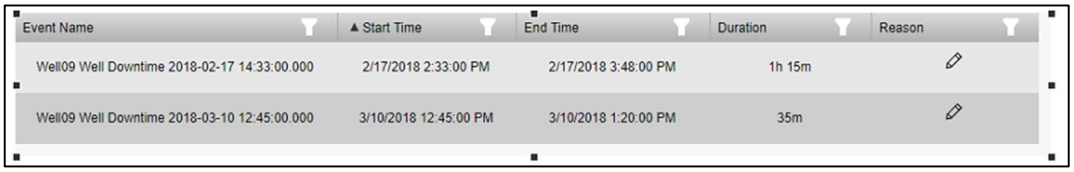



5. In the Configuration Pane, remove from the current columns **Asset** and **Acknowledgement**, and add the columns **Duration** and **Reason** using the Add/Remove columns arrows.
6. In the **Style** section of the Configuration Pane, Select the Light color scheme:

7. In the **Edit Search Criteria** section of the Events Pane, add an **Event Name** search filter for "*Downtime*" and then click **Apply**:




8. Resize the Events Table symbol outline and columns so that no nothing is cut off or wraps to the next line:

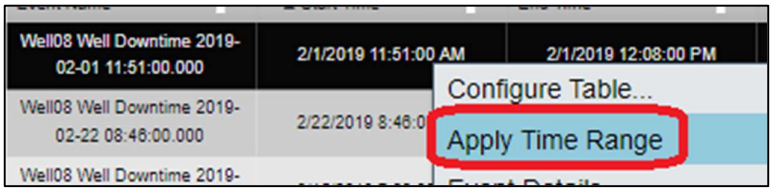



9. Place the Events Table symbol at the bottom of the display and adjust the position of other symbols if desired.

**Note**:

If needed, the **Zoom Out** button is located in the bottom right of the display.

10. Right click on an Event in the table and select **Apply Time Range** to set the display Start Time and End Time to match the downtime event:



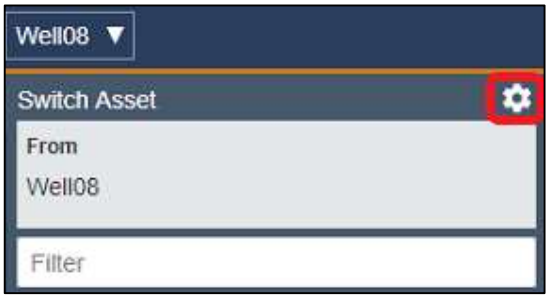

11. Switch to the Monitor Operations mode using the ruler and pencil icon in the top right corner of the toolbar:

12. Click the Pencil graphic in the **Reason** column for the same Event in the table, and then expend the Reason hierarchy to select a Pump Breakdown as the reason for the downtime:

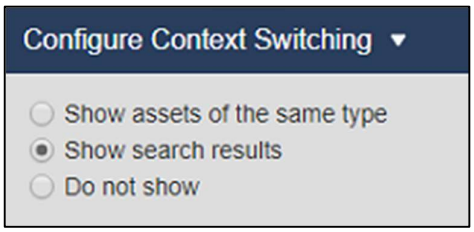
**Note**:

Setting the Reason Code in PI Vision saves the information on the underlying event. Going forward, anyone that views this particular event will see an explanation of what caused the downtime.

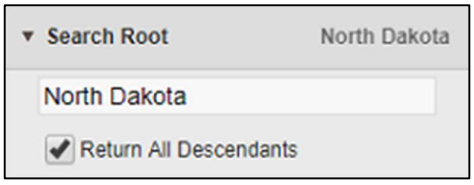
13. Next, we will configure the asset list to limit the switch asset function to wells in North Dakota. Open the Asset drop-down menu on the top of the display and then click the configure button



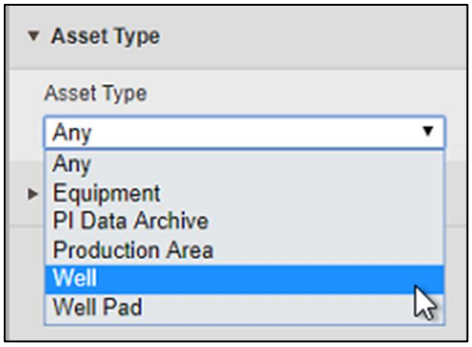

14. Toggle the Context Switching to **Show search results**



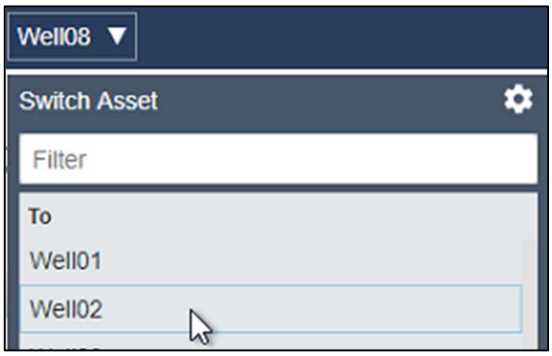

15. Adjust the search root to “North Dakota” and enable **Return All Descendants**



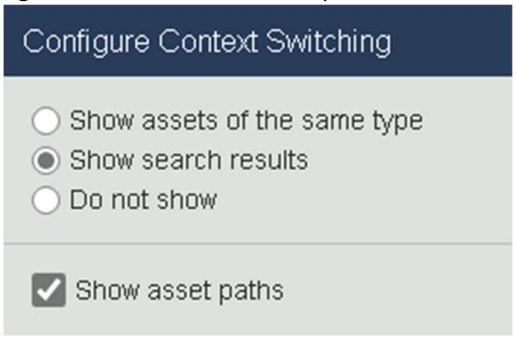

16. In the **Asset Type** dropdown menu, select Well




17. Open the Asset dropdown menu and click **Well02** to change the display context. The list now only includes wells in the North Dakota region.



18. Since we cannot tell from the well name to which well pad they belong it would be nice to have this information shown in the asset list. To show the path, open up the configuration again and select Show asset paths.




19. The list will now show the path.

20. Save the display.

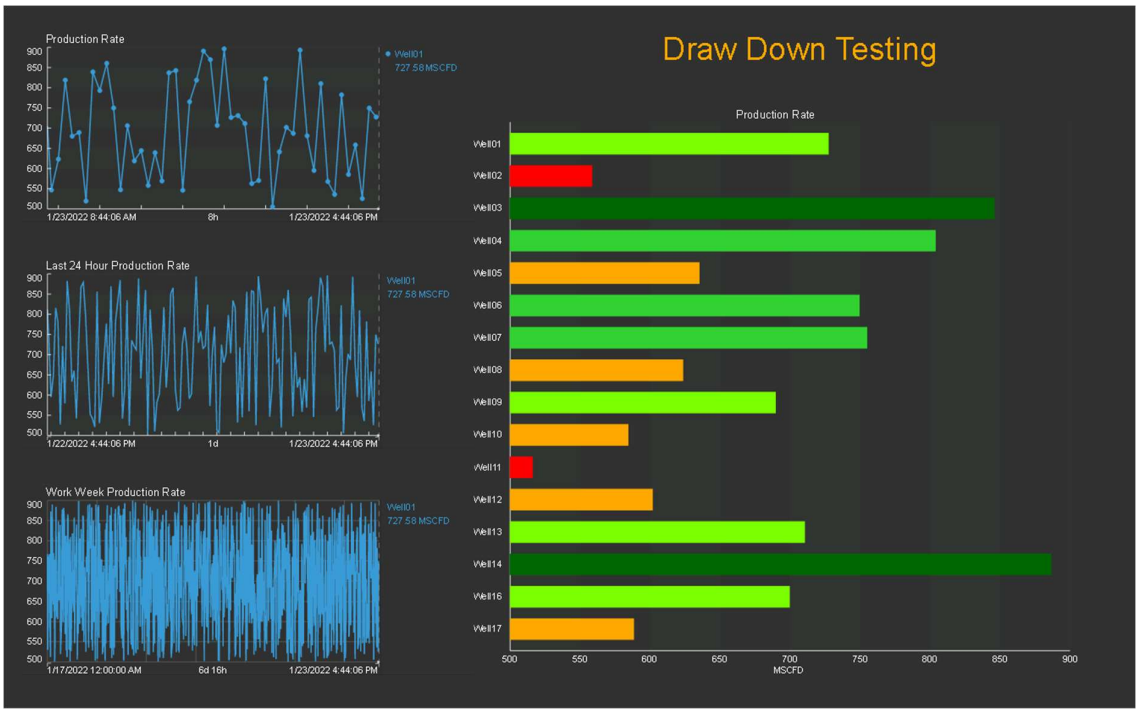
# Challenge 4: Explore other options to work with symbols in PI Vision

You heard about some of the other options the most recent PI Vision  versions have to offer and want to try them out. In the past, the TechCon Labs management team has asked for displays showing trends with different time ranges. Now it is possible to do this. You want to create a demo display to show this and other new possibilities to the management.

You want to demonstrate the following features:

- You would like to display the Production Rate of Well08 in a trend covering the time range of the display and at the same time see the data for the last 24 hours and for the current work week in two separate trends on the same display.
- Set a descriptive plot title for each of the trends.
- Change the legend label to display the asset name instead of the attribute name.
- Place the scale labels outside of the plot area.
- Use data markers on a trend line.
- Change the grid style to use lines.
- Configure a status message to show up only when the status is different from Running.
- Create a Bar Chart symbol to see the Power Consumption of all wells and configure this for context switching for the display.

The complete demo display should look something like the following:



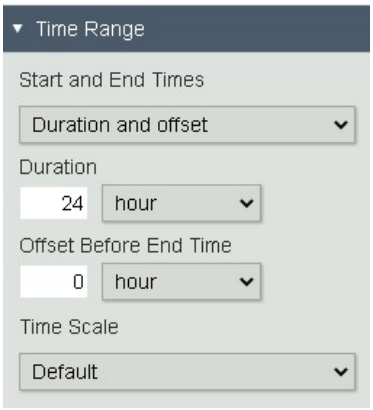
## 4.1: Create a display with multiple time ranges

1. Create a new display.
2. Make sure the trend symbol is selected, then search for **Well08** and drag the **Production Rate** attribute on to the display area.
3. Copy and paste the first trend 2 times.
4. Arrange the trends in one row on the display.

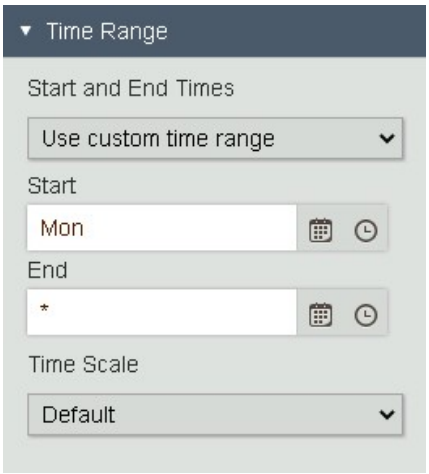
**Tipp:**

To arrange the trends on the display, you can use the new **Snap to Grid** function or select the three trends and use the functions in the **Arrange** menu.

5. Right click the second trend and select the **Configure Trend** option.
6. Open up **Time Range** and select **Duration and Offset**. Make the Duration 24 hour and offset 0. This will result in a trend with the same end time as the first trend but with a start time 24 hours previously.



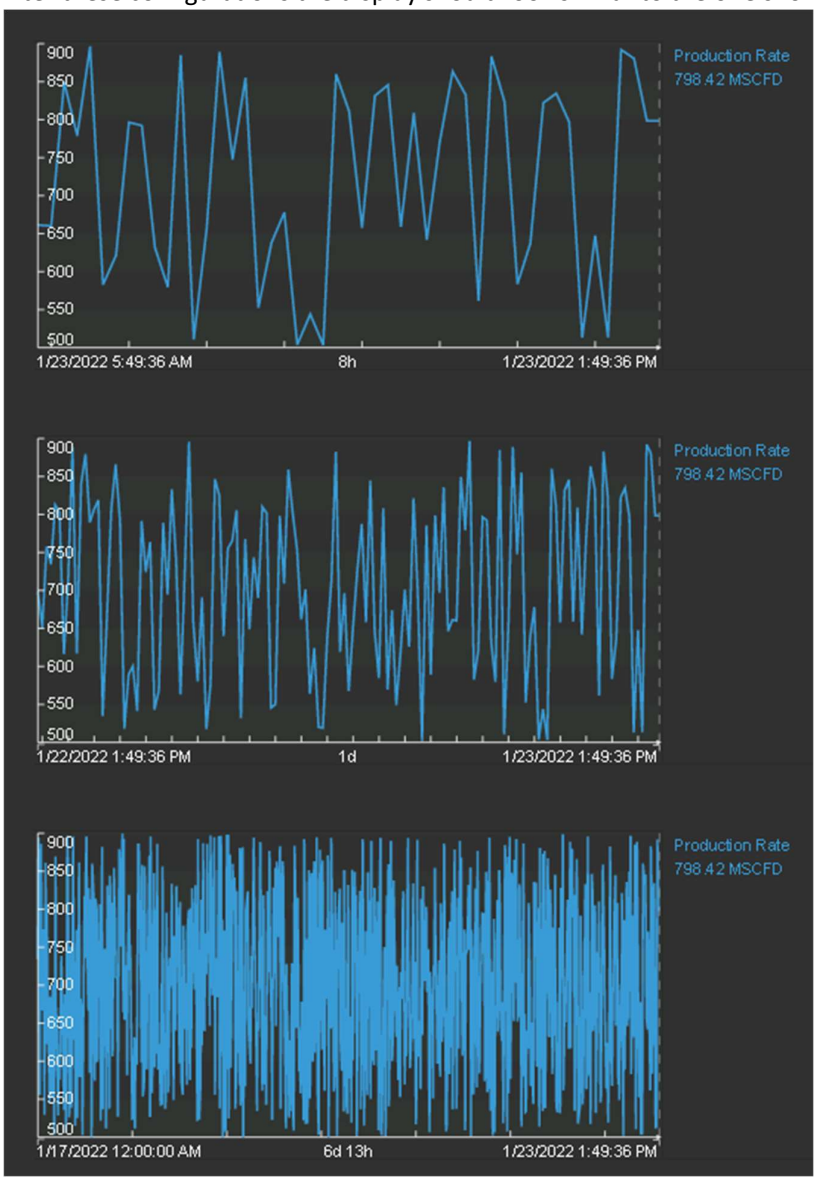

7. For the third trend, select **Use custom time range**. Specify Monday (or Mon) as the start and * as the End.



**Note:**

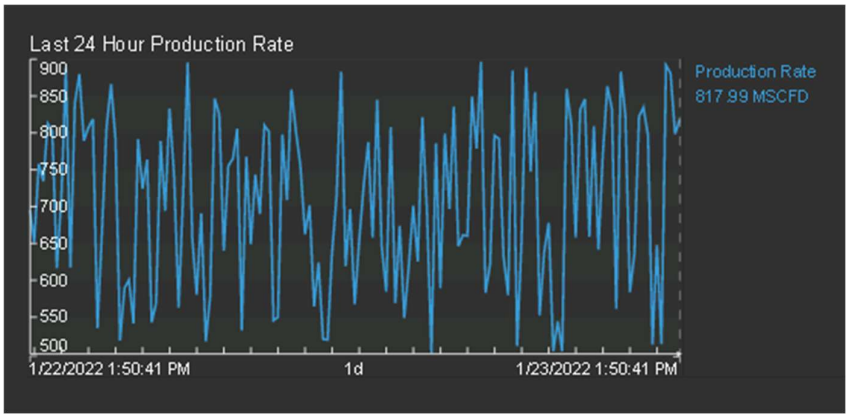
To learn more about the options for entering the Start and End times see PI time on OSIsoft Documentation.

8. After these configurations the display should look similar to the one shown below.



## 4.2: Explore the new configuration options for trends.

1. Under Trend Options, set a descriptive **Plot Title** for each of the trends, for example *Last 24 hour Production Rate* for the trend in the middle and *Work Week Production Rate* for the third trend. For each title, press enter to confirm before you move on to the next trend.

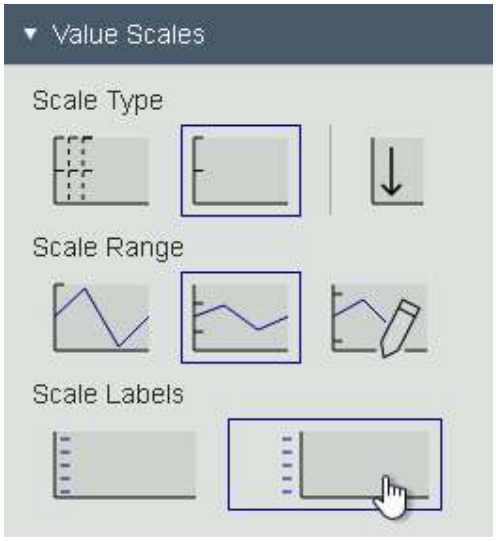



**Tipp:**

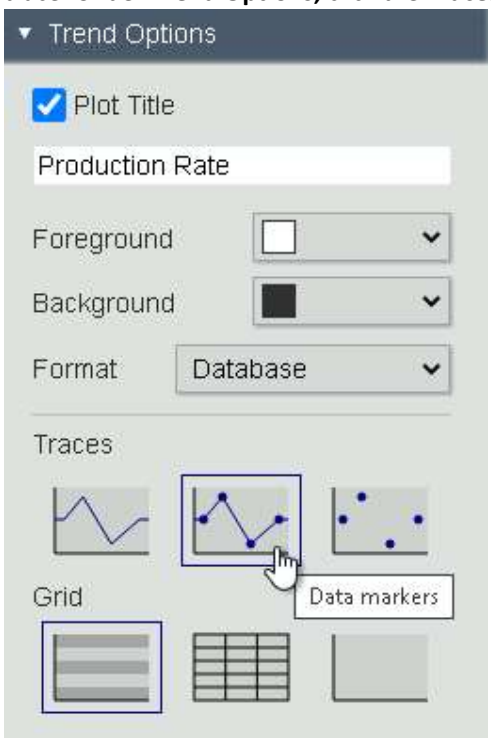
If you need to make configuration changes to a couple of assets you can leave the configuration pane open and select the next asset to change.

2. Since the plot titles are stating that we are looking at the Production Rate we do not need to have this again in the legend. Instead, we would like to see the Well name in the legend. Under **Trace Options,** expand the drop-down menu for **Legend Label** and select Well08.

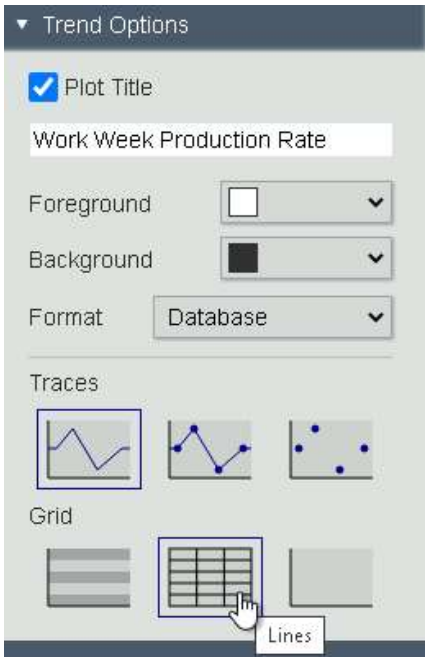
3. To have a clear view onto the data at the start time of each trend we want to display the **Scale Labels** outside of the plot area. Under Value Scales, click on the Scale Labels symbol for **Outside plot area**.



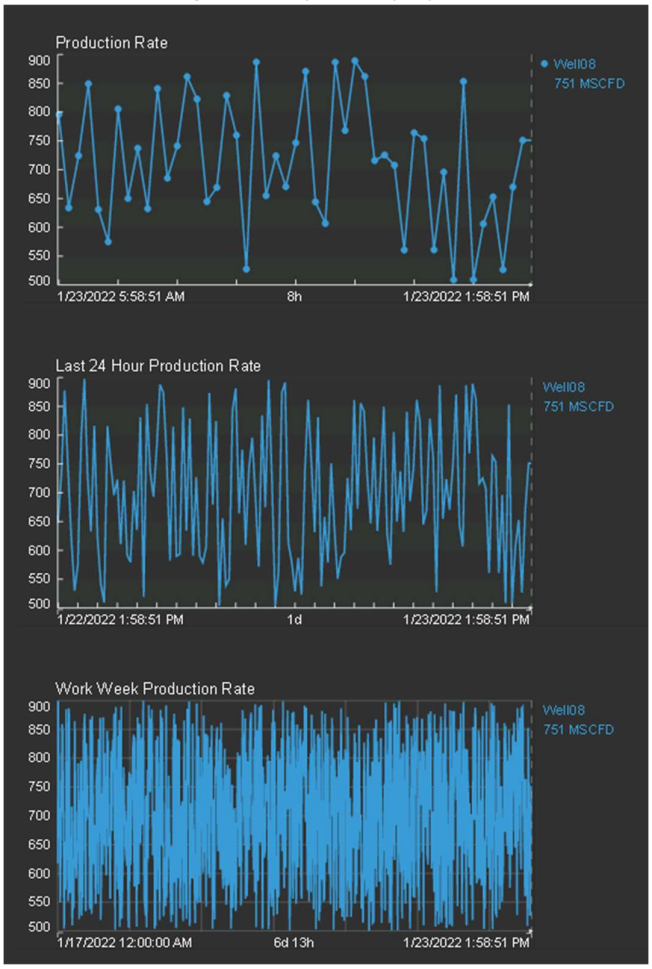

4. For the trend using the display time range, we would like to display data markers on the line trace. Under **Trend Options,** click the **Traces** symbol for **Data markers**.




5. Since time range of the work week trend will vary, we want to use a different grid style to make this more apparent. Under Trend Options, click on the **Grid** symbol for **Lines**.




6. After these configurations your display should look similar to the one shown below.

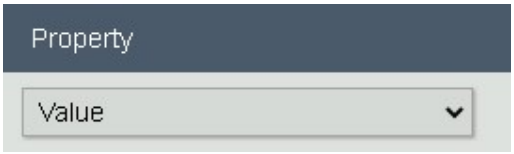


## 4.3: Hide Status Message

You have heard that PI Vision also enables the option to hide symbols using the Multi-State functionality. You want to make use of this for displaying the Status Message on the display only when it is in any other State than Running.

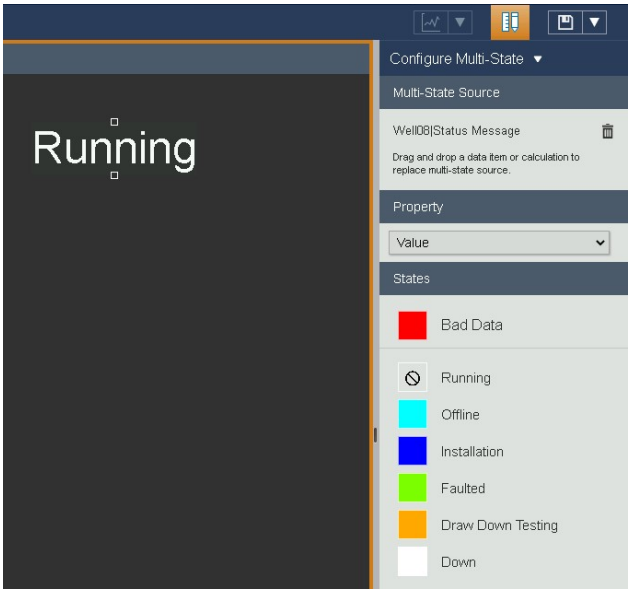
1. Select the **Value** symbol and drag the attribute **Status Message** of **Well08** onto the display. Adjust the size to make it clearly visible on the display. In the **Format Value** menu under **Visibility** uncheck all but Value.

2. Right click on the symbol and select **Add Multi-State**. The color of the states should apply to the Value only. Under **Property,** select **Value** from the drop-down menu.




3. Under **States**, click on Running and tick the check box for **Hide**.

4. The value Running is shown again in the original color as long as we are in Modify Display mode.

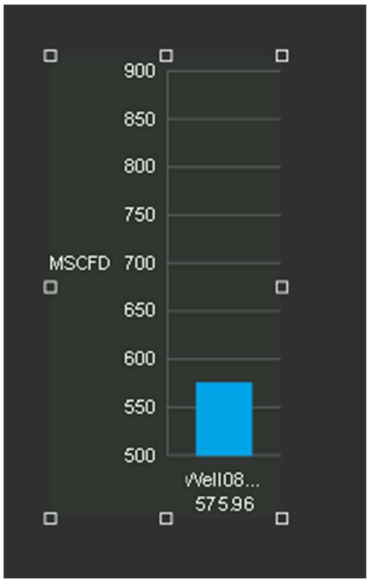



5. Click on Modify Display to exit Design mode to see that the value is not shown any more when the attribute is in the state Running.

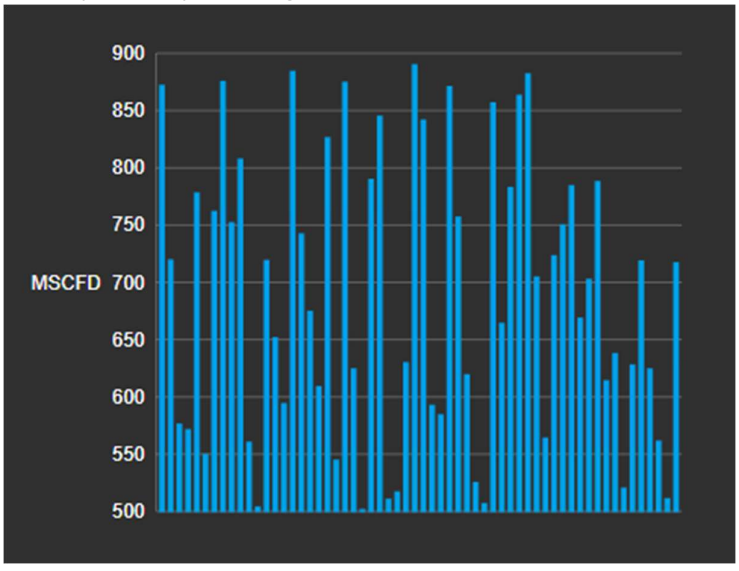
## 4.4: Create a Bar Chart Symbol

Next, we want to create a Bar Chart symbol to get an overview of the current production rate of all our wells. We will also configure this symbol for easy asset switching of the display.

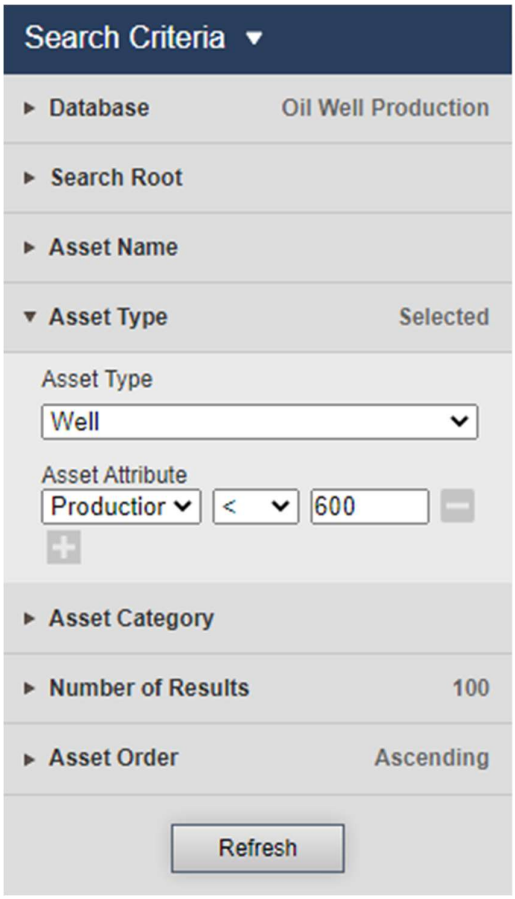
1. Click the **Modify Display button** (ruler and pencil) to place the display back into Modify Display Mode.
2. Select the **Bar Chart** symbol and drag the attribute **Production Rate** of **Well08** onto the empty right side of the display. You will get a Bar Chart displaying one bar for the currently selected well.



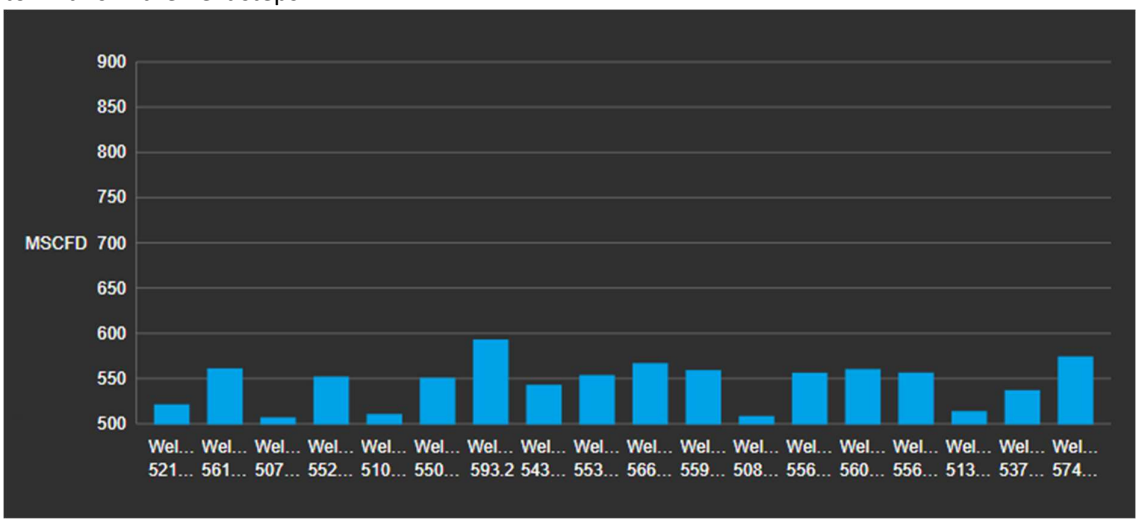

3. To include all other wells, right click on the symbol and select **Add Dynamic Search Criteria**.
4. Delete the current **Search Root** "North Dakota\Crosby" and leave the field blank to search from the root level down. Tick **Return All Descendants**.
5. By default the maximal number of results returned is limited. To see all wells, increase the **Number of Results** to 100. Since there are so many bars, there is no space for labeling and we only know by hovering over the individual bars which assets they belong to.



6. To get a more condensed chart showing only what is important, we will modify the search criteria to only show badly performing assets. We will define this here as assets having a current Production Rate of less than 600.

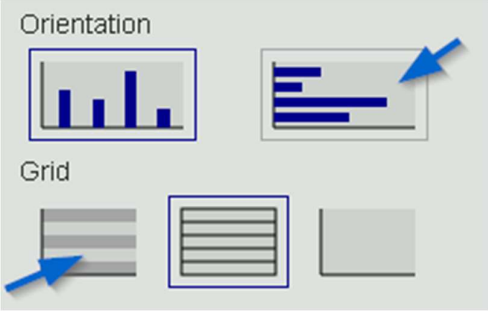



7. By resizing the symbol, we might be able to see asset names, but as shown below, the space on the display might be too tight to display everything. We will go into further configuration to fix this in the next steps.

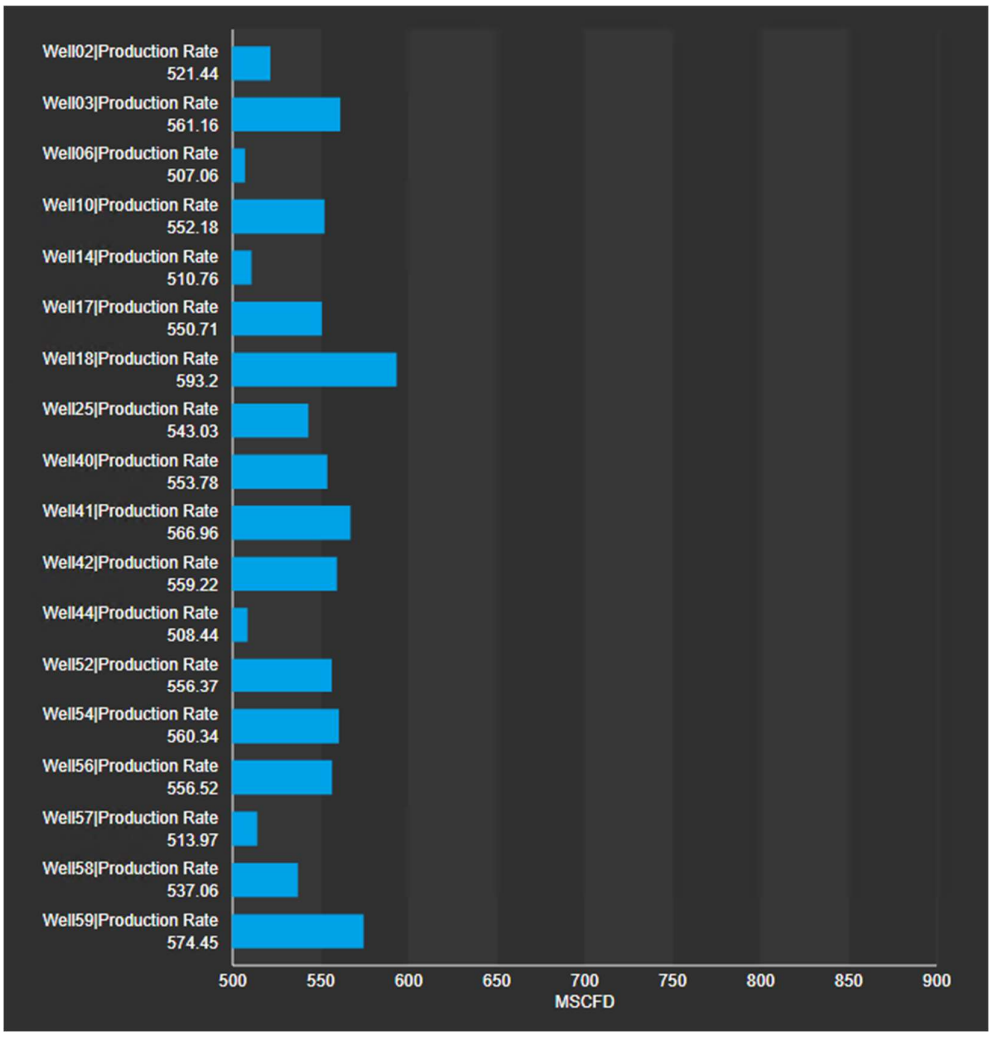



8. Right click the symbol and select **Format Bar Chart**.

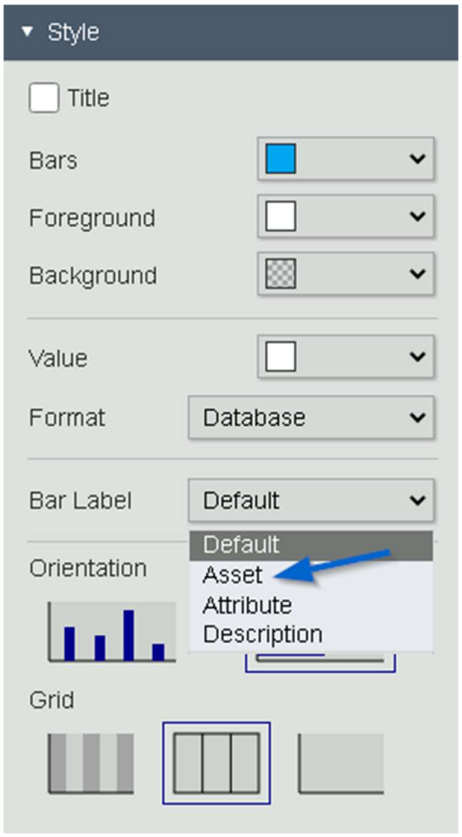
9. First, we will change the **Orientation** to better use the space on the display. Select **horizontal** orientation and switch the grid style to **bands**.



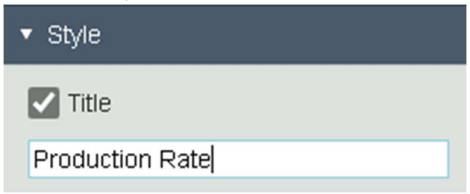

10. Again you might need to adapt the size of the symbol to see the labels. In the picture below, I have now been able to fit the labels in completely. But in fact there is a lot of information I would not need here.



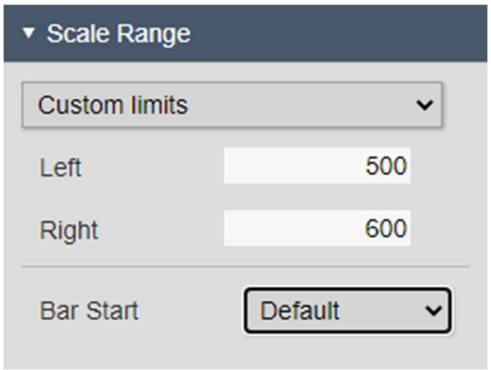
11. In the **Visibility** section, we can deselect Value. We want to keep the label, but we can make it simpler. In the **Style** section we can select what is shown as **Bar Label**. Select **Asset** since the Well name will be sufficient.




12. To still keep the information which attribute is being displayed, we can add a **title**.

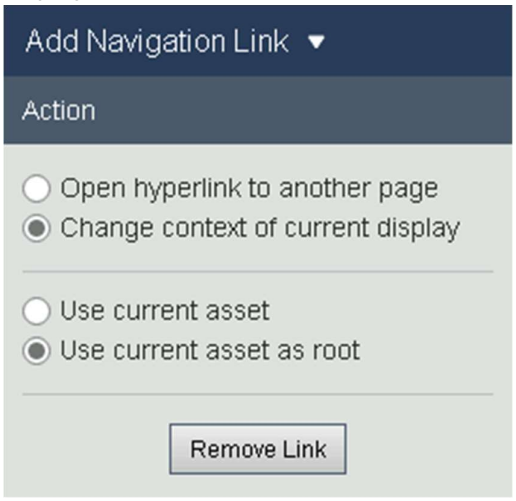



13. Since we have limited the maximum of the Production Rate being displayed, it makes sense to adapt the **Scale Range** accordingly. Open up the Scale Range section and choose **Custom limits**. Set 600 as the **Right** limit.



14. For a better visual distinction between the performance levels, we can add multi-state functionality to the symbol. Right click the symbol and select **Add Multi-State or Bands**. You can change the limits and colors, for example as shown below.

15. As a last configuration step, we want to use the Bar Chart for swapping assets on the display. Right click on the symbol and select **Add Navigation Link**. Select **Change context of current display** and **Use current asset as root**.



16. Save the display as *Vision Demo_<your initials>* and exit the Modify Display Mode to test the functionality. When you click on one of the bars, the trends and the Status Message value symbol will change the context to the asset selected.

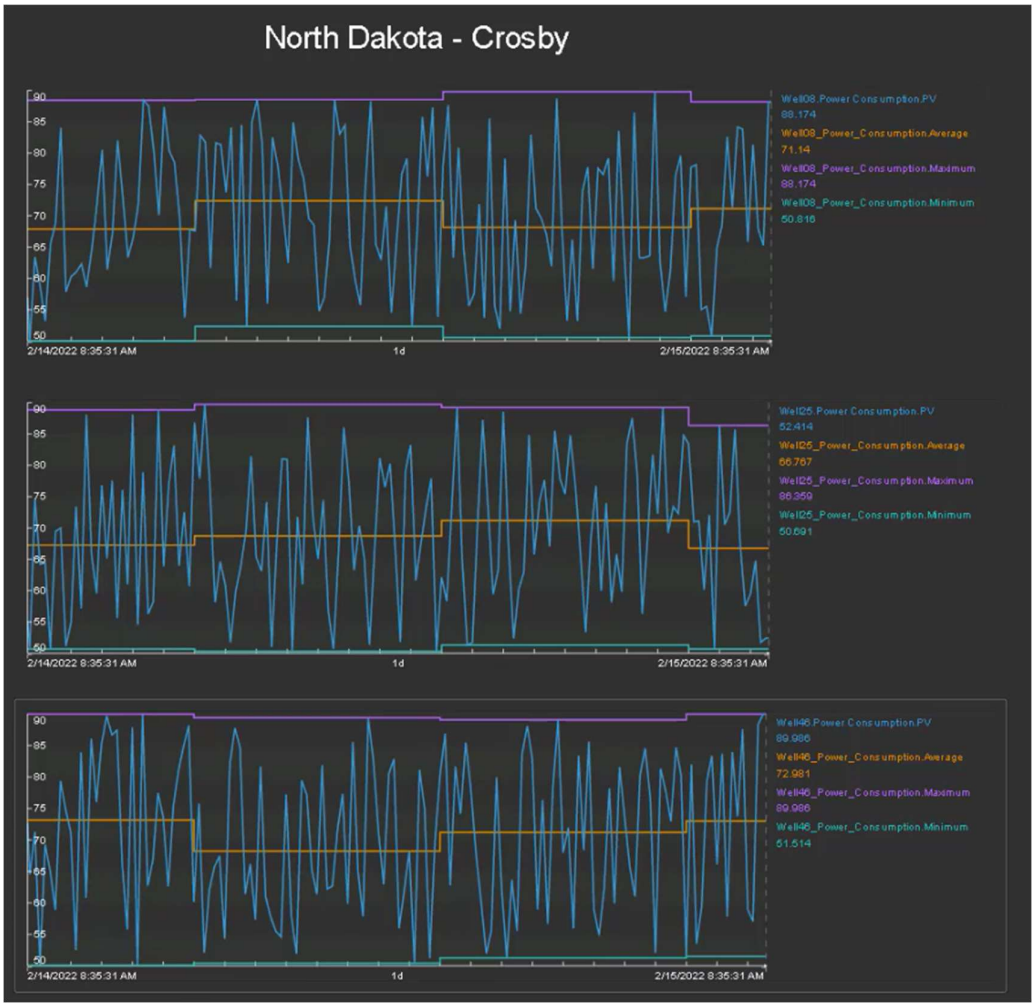
# Challenge 5: Calculations

## Part 1: Tag-based Calculations

The team at the Crosby site is still using displays which are based on PI Tags. Originally those were migrated PI ProcessBook displays containing PI Calculation data sets. Through the migration to PI Vision displays the data sets became PI Vision Calculations. The team has asked you to perform some modifications on the Crosby Power Consumption display.

- Make use of the existing PI Vision Calculations and add the minimum and maximum values to the trends.
- Instead of the 1 hour Calc Interval you want to see the calculation results for each shift. Edit the calculation to set the Calc Interval to 8 hours, enable the Sync Time and set it to 06:00:00 to match the shift schedule with 8 hour shifts starting at 6 am.

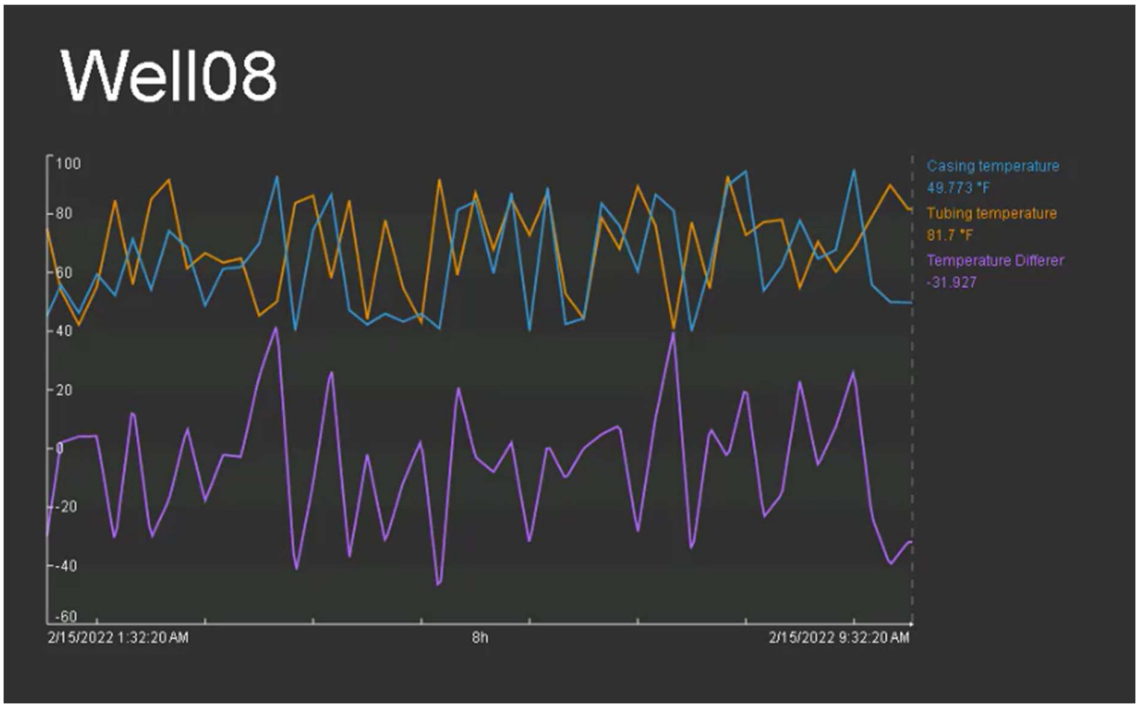
The result should look similar to the picture shown below.



## Part 2: Asset-based Calculations

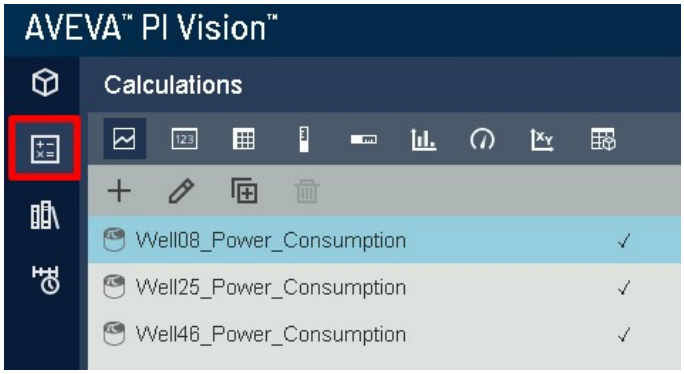
Your manager wants you to create a display showing the Casing Temperature and the Tubing Temperature and the difference between the two together in a trend. No analysis exists to calculate the difference and you do not have the rights to create one. Furthermore, this calculation would not be used anywhere else so you do not want to bother the PI Admin with this and decide to use PI Vision Calculations instead.

The result should look like this:

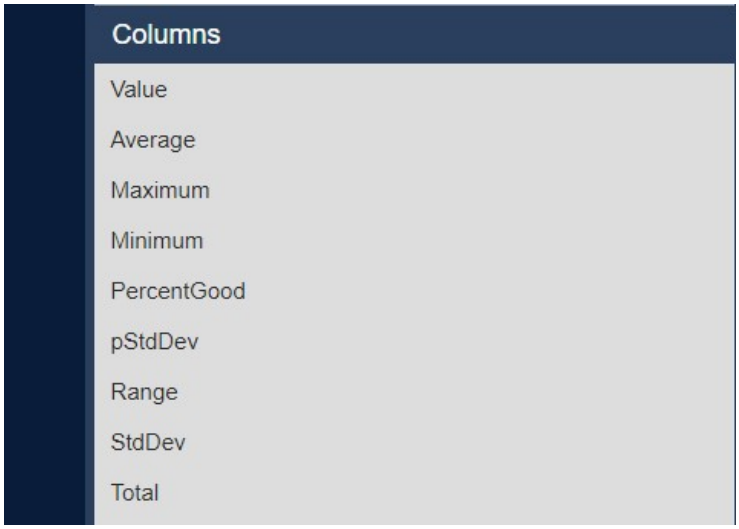


## 5.1: Add Minimum and Maximum values from an existing Calculation

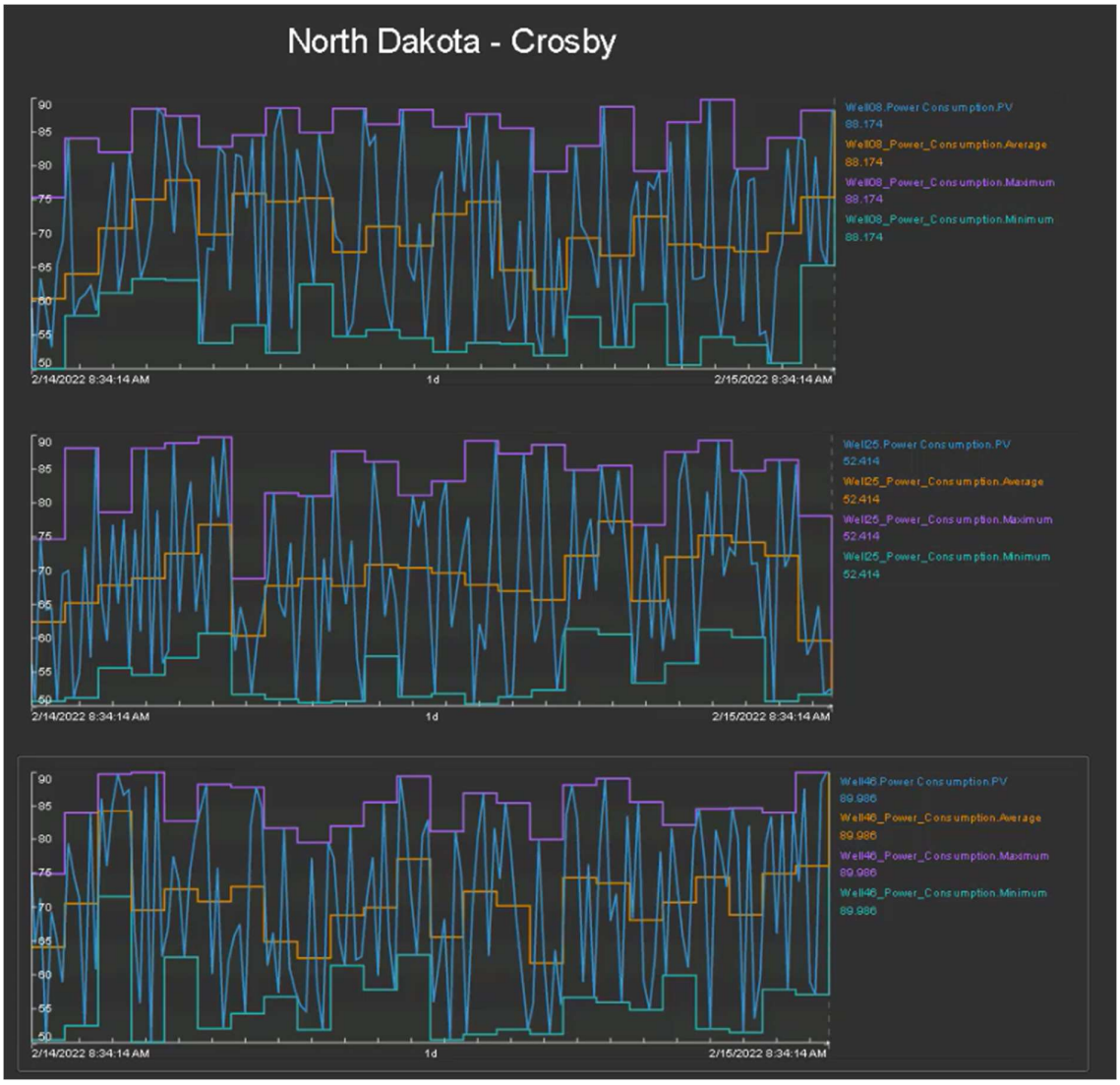
1. Open the display **Crosby Power Consumption**. The display is set to read- only so you need to save the changes under a different name. Click the **Save** button and select **Save As** to save a copy of the display with the name *Crosby Power Consumption_<your initials>.*
2. Click **Calculations** on the left side of the screen. The list shows three calculations for the Power Consumption of the three wells in Crosby. The tick mark shows that the calculation is already used on the display.




3. We want to make use of the calculations by adding the **Minimum** and **Maximum** values to the trends. Drag and drop the Minimum and Maximum from the Columns list to each of the trends. Make sure to use the correct calculation for each well.

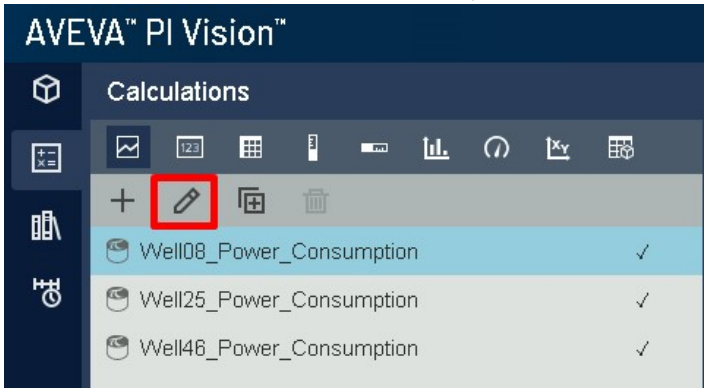


4. The result should look similar to the picture shown below.

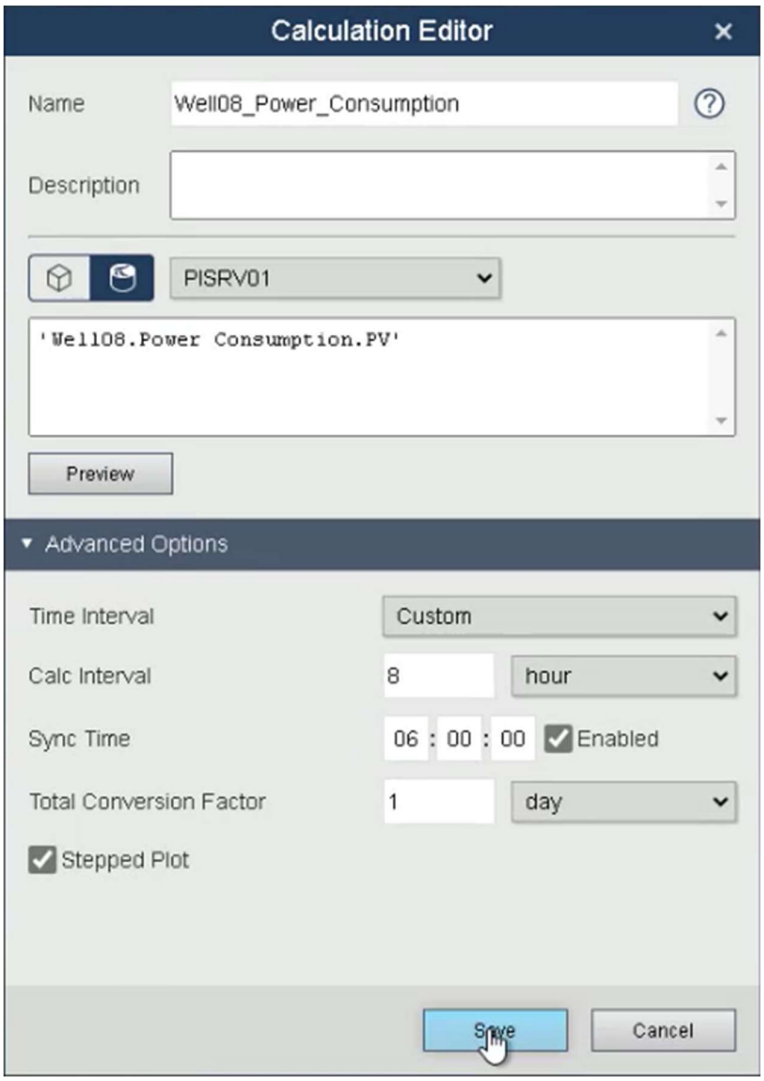


## 5.2: Edit a Calculation

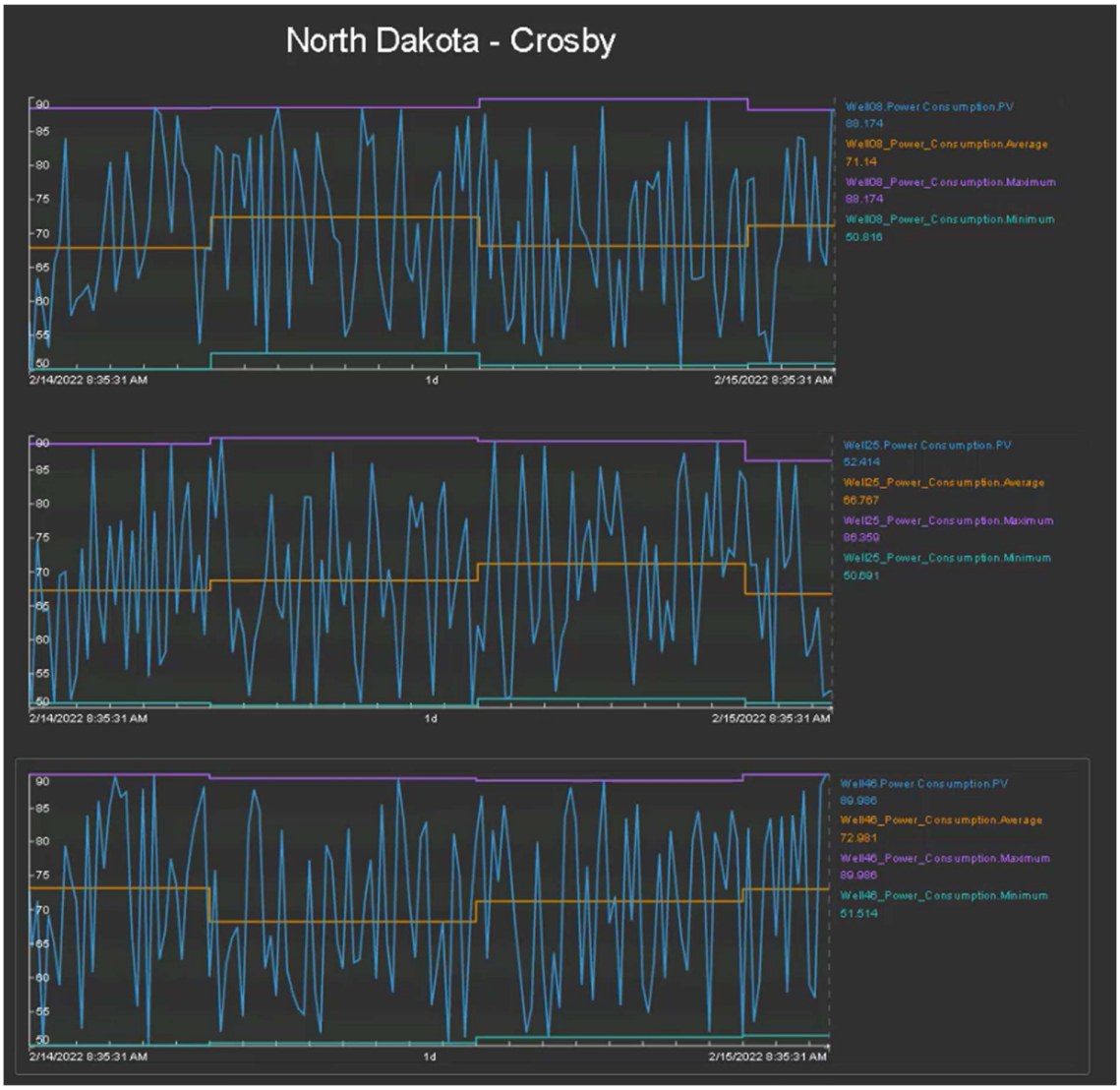
1. We want to edit the existing calculations to use the shifts as a calculation basis.
2. Select a calculation and click on the **Edit** symbol.




3. Under **Advanced Options** in the Calculation Editor set the **Calc Interval** to 8 hours. Click the **Enabled** box for Sync Time and set the **Sync Time** to 06:00:00. Click Save.



4. Repeat this for all three calculations and save the display. The resulting trends should look similar to the picture below.

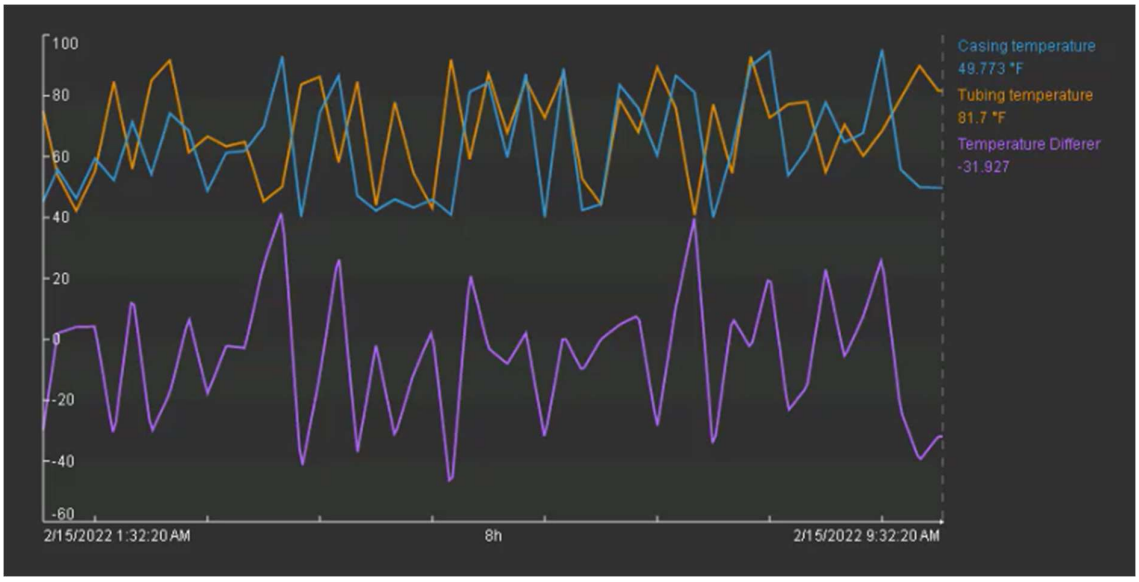


## 5.4: Create and Use an Asset-based Calculation

1. Create a new display.
2. In the Assets Pane, search for **Well08**.
3. Create a value symbol showing the **Well Name** and a trend with the **Casing Temperature** and the **Tubing Temperature** attributes.
4. Right click on the Value symbol and select Format Value. Under Visibility, deselect **Label** and **Timestamp**.
5. Right click on the trend and select Configure Trend. Under Value Scales, select the symbol for **Single Scale**.
6. Select the trend and click on the calculation icon . In the calculation menu you will see a number 2, next to the "+" symbol. That means that PI Vision automatically detected that the attributes in the trend are meant to be in a calculation and added them for us.

7. Click on the . Name the calculation "Temperature difference" and fill the description. Change the expression to be "'Casing temperature' - 'Tubing temperature'". Click on preview and save the calculation. Check that this time the cube is selected because we are using an asset instead of a PI Point.

8. Drag and drop the calculation to the trend.




9. Save the display with the name *Temperature Differences_<your initials>.*

# (Optional) Challenge 6: Link displays together

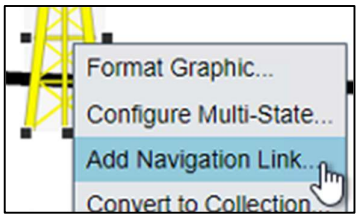
At this point, the TechCon Labs management team is very pleased with the dashboards you have created. But they are concerned that the navigation from one display to another by first returning to the PI Vision home page is a bit cumbersome. They have requested that the overview and detail displays be linked together, preferably in an intuitive way that benefits infrequent or inexperienced users of PI Vision. For example, when a user wants to know more information about a specific well pad or oil well, they should be able to just click on it.

As a side note, the director mentioned they feel that the borders of the current dashboards are too cluttered with functional items such as the toolbar and other functional items. If all goes well with the display linking, they would also like you to design a way to present these displays in a more focused manner.

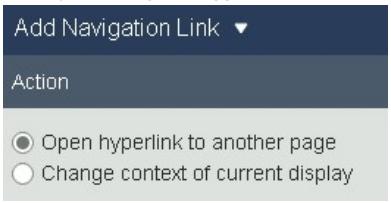
Fortunately, you are familiar with all the navigation and URL functionality in PI Vision and know that this can be implemented on the existing dashboards fairly easily.

## 6.1: Update the North Dakota Overview Display

1. On the PI Vision Home page, open your **North Dakota Overview** display.
2. Click on the **Design button** on the far-right side of the toolbar to enter **Design Mode**.
3. Right-click on the **Crosby Oil Well** graphic and select **Add Navigation Link…**

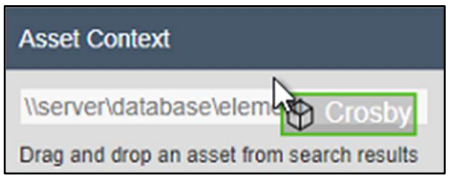



4. Verify that **Open hyperlink to another page** is selected under the **Action** header:




5. In the **Hyperlink** section, click **Search for displays…** and find the **Well Pad Detail** display that was created in Challenge 2:

6. In the Asset Pane, drill down into the **Oil Well Production** database to find the **Crosby** element.
7. Click and drag the **Crosby** asset into the **Asset Context** field in the configuration pane.

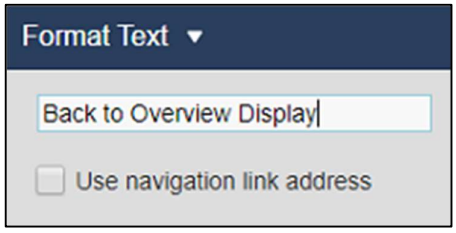



> **Note**:
>
> This **Asset Context** field determines which asset will be selected when the linked display is opened. In some scenarios this does not need to be explicitly set. For example: when using links within Collections and Asset Comparison Tables, PI Vision is able to automatically determine the appropriate asset.

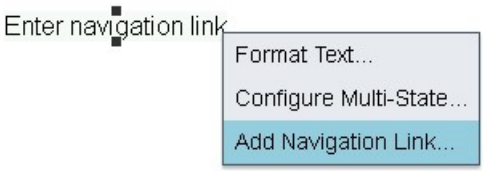
8. Repeat steps 3-8 for the **Kenmare**, **Williston**, **Stanley**, and **Dickinson Oil Well** graphics using the **Kenmare**, **Williston**, **Stanley**, and **Dickinson** assets from the Asset Pane.

## 6.2: Update the Well Pad Detail Display

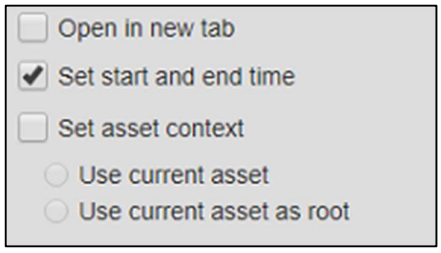
1. Click on the ruler and pencil icon on the right side of the toolbar to switch to **Monitor Mode**.
2. Double-click on the **Oil Well** graphic next to **Crosby** to activate the newly added Navigation Link and open the **Well Pad Detail** display.
3. Click on the ruler and pencil icon again to switch back to Design Mode.
4. Select the **Text** button on the toolbar and click on the top left corner of the display. Type "Back to Overview Display" under **Format Text** on the configuration pane.



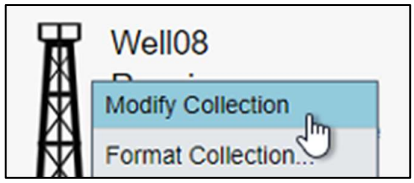

5. Set the **Font Size** to 12.
6. Right-click on the added Text symbol and select **Add Navigation Link**:




7. Under the **Hyperlink** header search for and select the **North Dakota Overview** display.
8. Deselect the **Set asset context** option. The **North Dakota Overview** display is not currently built to support context switching:



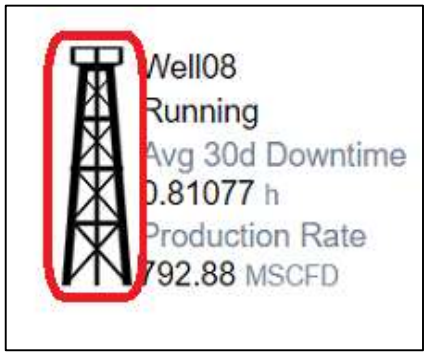

9. Right-click anywhere on the **Oil Well** collection and select **Modify Collection**:




10. Right-click on the Oil Well graphic and select **Add Navigation Link…**
11. Under the **Hyperlink** header, search for and select the **Oil Well Detail** display.
12. Save the display.

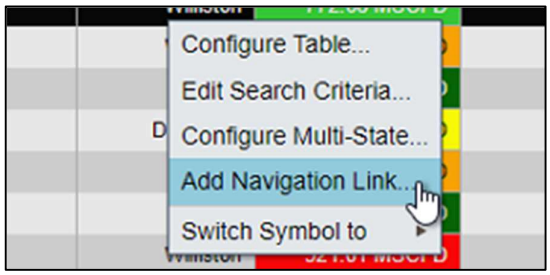
## 6.3: Update the Oil Well Detail Display

1. On the **Well Pad Detail** display, select the "Back to Overview Display" text symbol and copy it using either the toolbar icon or the keyboard shortcut (Ctrl + C).
2. Click on the ruler and pencil icon on the right side of the toolbar to switch to **Monitor Mode**.
3. Double-click on an **Oil Well** graphic within the collection to activate the Navigation Link to the **Oil Well Detail** display:

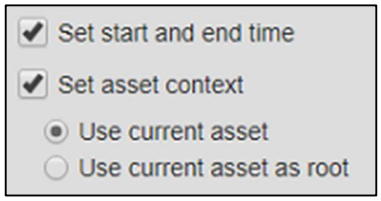



4. Click on the ruler and pencil icon again to switch back to **Design Mode**.
5. Paste the copied "Back to Overview Display" text symbol from earlier into the top left corner of the display using either the toolbar icon or the keyboard shortcut (Ctrl + V).
6. Click on the ruler and pencil icon on the right side of the toolbar to switch to **Monitor Mode**.
7. Single-Click on the Text symbol to return to the **North Dakota Overview** display.

8. Right-click on the Asset Comparison Table symbol and select **Add Navigation Link…**




9. Under the **Hyperlink** header, search for and select the **Oil Well Detail** display.
10. Verify that **Set start and end time** and **Set asset context** are selected:



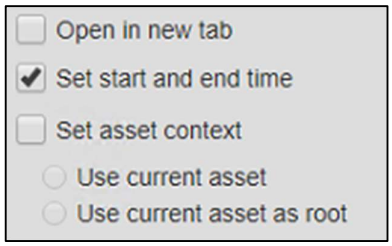

11. Save the display.

12. Click on the first well under the **Asset** column of the Asset Comparison Table:

13. Click on the ruler and pencil icon again to switch back to **Design Mode**.
14. Click the **Text** icon on the toolbar:

15. Create a Text symbol in the top left corner of the display that reads “Back to Well Pad Display”.
16. Change the **Font Size** to 12.
17. Right-click on the Text symbol and select **Add Navigation Link…**
18. Under the **Hyperlink** header, search for and select the **Well Pad Detail** display.

19. Deselect the **Set asset context** checkbox. Only the **Set start and end time** option should be selected:

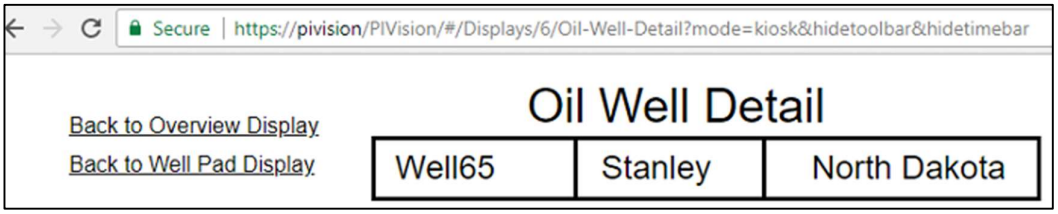



It is expected that our link to the **Well Pad Detail** display from the **Oil Well Detail** display will not update the city context of the display. This would be possible to do if we get a bit creative, but it is outside the scope of this lab.

20. Save the display.

## 6.4: Experiment with URL Parameters

In the browser address bar, add the string **?mode=kiosk&hideToolbar&hideTimebar** to the URL and click refresh. The result should be a cleaner, more streamlined display view that hides elements from the topbar, the toolbar, and the timebar:




**Note**:

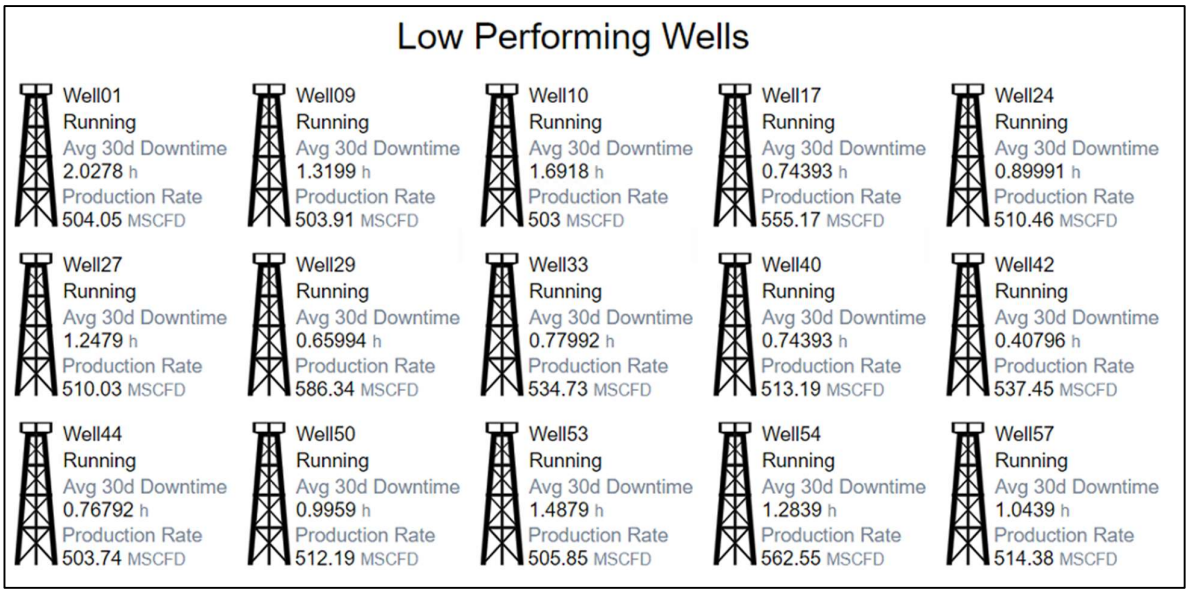
Navigate through the three different displays while changing the asset and time context to verify all the displays link functionality is working. Once you are finished, you will need to manually remove the URL parameters from the URL in order to begin the next challenge.

# (Optional) Challenge 7: Collection Search Criteria

The PI Vision dashboards have become heavily used within the team monitoring North Dakota operations. Word has spread and there is interest from the executive management team in expanding the use of PI Vision to cover all of North American production. Before that, however, they would like to see something a bit different from any existing dashboard. On a single display, they would like to see the lowest performing Oil Wells in all of North America.

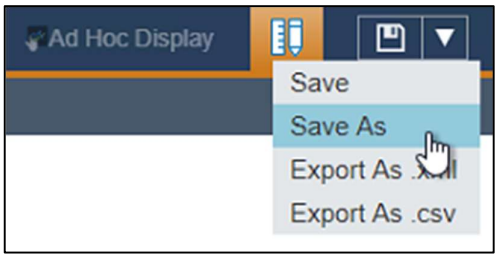
The management team knows this sounds like a tricky request and has offered to bring in developers in case a programmatic solution is needed. But your experience with PI Vision asset collections tells you that this will not be necessary.

So that they have an idea of the final product, you have provided the team a sketch of what this display will ultimately look like:

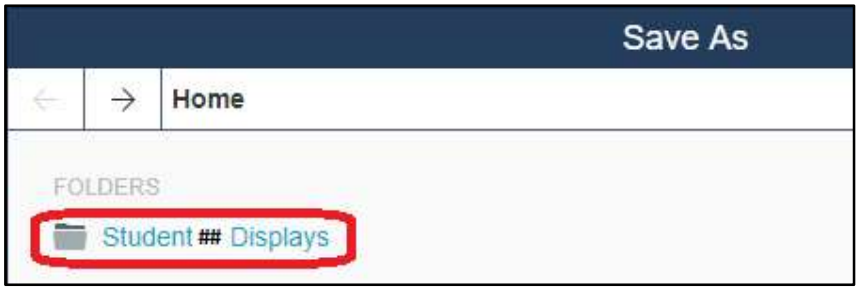


## 7.1: Filter Collection Assets with Asset Attribute Criteria

1. From the PI Vision home page open your **Well Pad Detail** display.
2. Click on the ruler and pencil icon again to switch to **Design Mode**.
3. Click on the **Save Display** drop-down menu and select **Save As**:

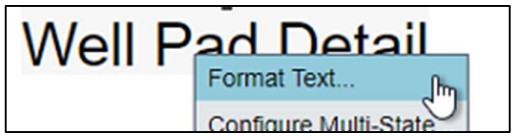



4. If it is not already selected, click on the display folder for your user account:



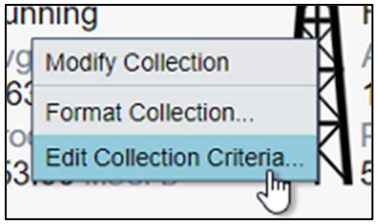

5. Name the display "Low Performing Wells" followed by your initials. For example: *Low Performing Wells_<your initials>.*
6. Saving the display will have returned you to **Monitor Mode**, so click on the ruler and pencil icon again to switch back to **Design Mode**.
7. Delete the Text symbol navigating to the **North Dakota Overview** display and the City & State value symbols. When selected, an item on a display can be deleted by clicking the trash bin icon in the toolbar, or by pressing the **Backspace** or **Delete** key on your keyboard:

8. Right-click on the **Well Pad Detail** text symbol and select **Format Text**:

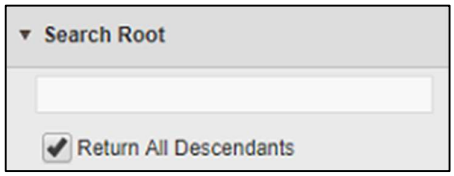



9. Change the text to "Low Performing Wells":

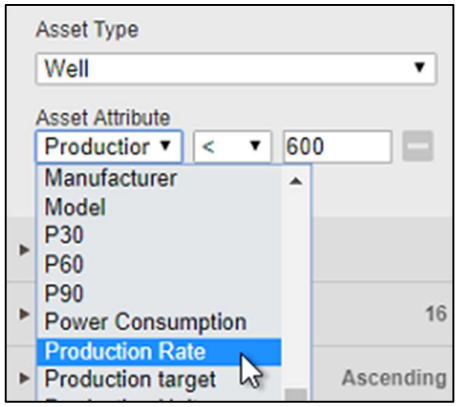
10. Right-click on the Oil Well collection and select **Edit Collection Criteria…**:




11. Remove the **Search Root** and select **Return All Descendants**:




12. Verify that the **Asset Type** is set to **Well**. Then set an **Asset Attribute** filter for a **Production Rate** value of less than 600 MSCFD:

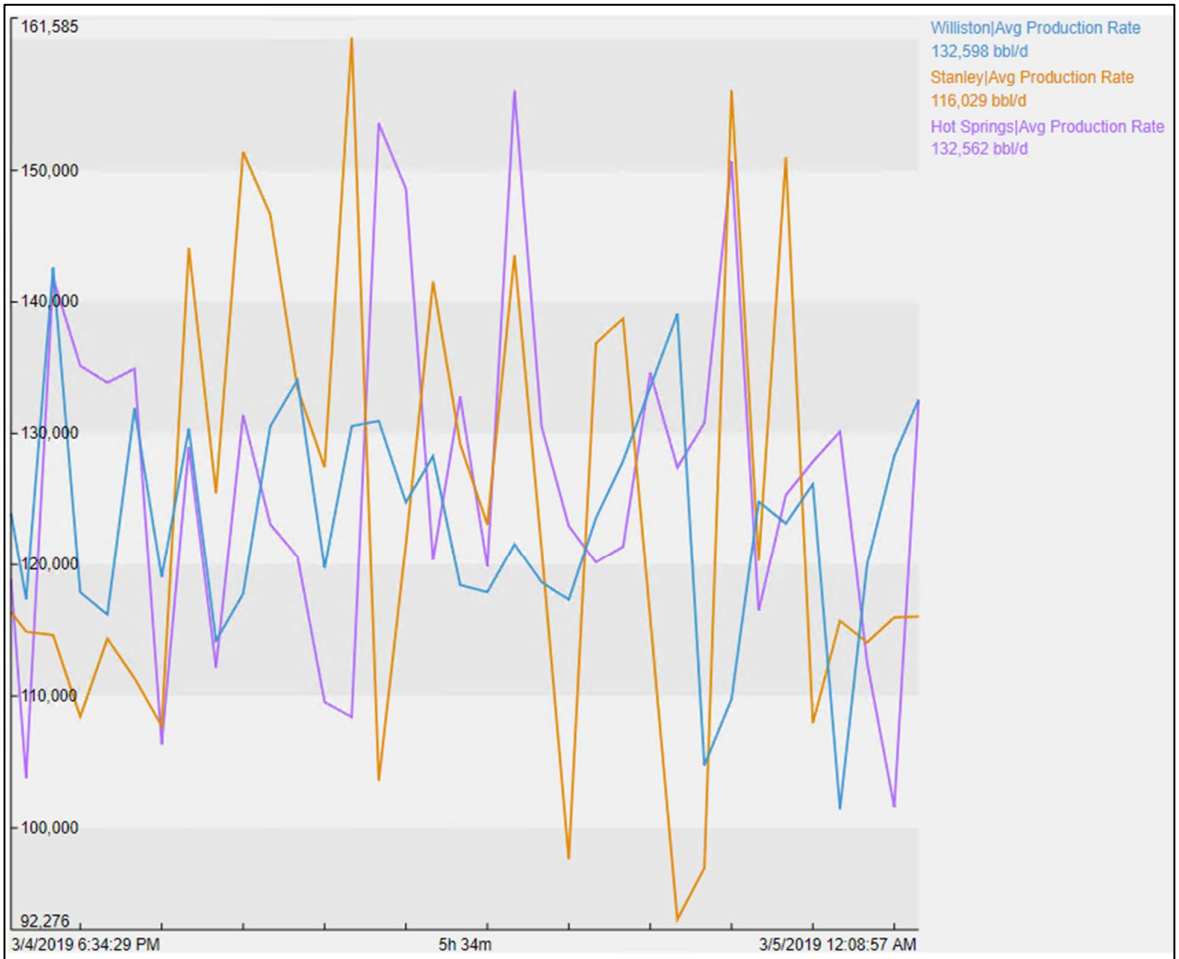



13. Save the changes to the display.

# (Optional) Challenge 8: Ad Hoc Analysis

Another request has come in from some members of the engineering team. For the most part, they are happy with the dashboards that have been created so far. But they would like to select a few different items from the displays and do some additional analysis when they investigate specific issues. If they identity something of interest, they would like to be able to share their findings with a colleague.

Fortunately, you remember that PI Vision revamped its ad hoc display functionality with an enhanced workspace.  You gather the team members for a quick demo.

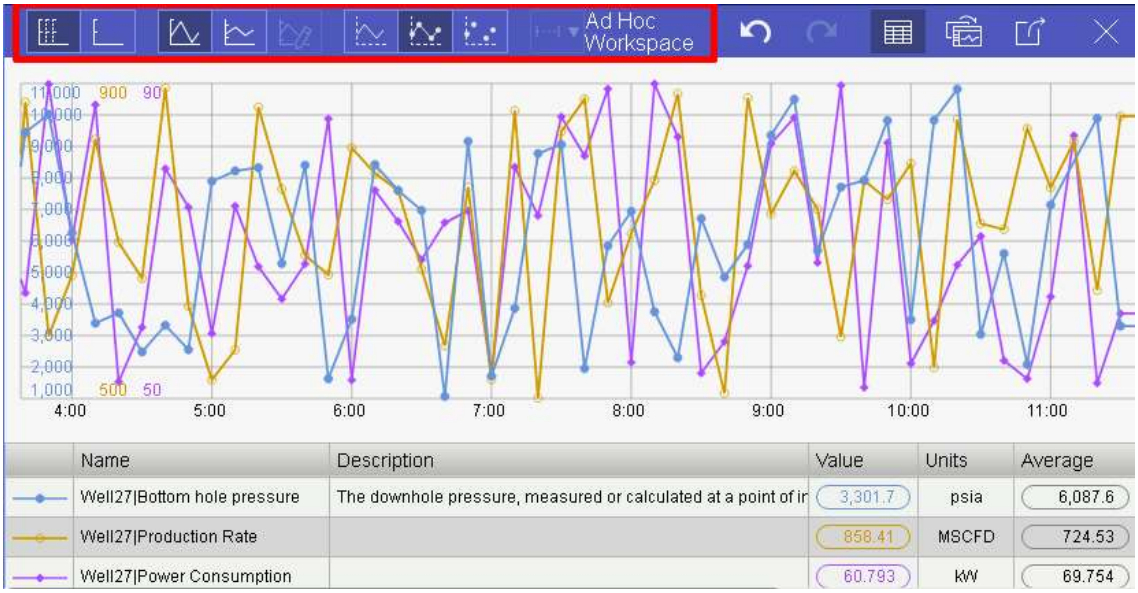



| Name | Description | Value | Units | Average | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Williston\|Avg Production Ra | Average production for all v | 132,598 | bbl/d | 123,276 | 101,433 | 142,606 |
| Stanley\|Avg Production Ra | Average production for all v | 116,029 | bbl/d | 124,260 | 93,067 | 160,092 |
| Hot Springs\|Avg Productior | Average production for all v | 132,562 | bbl/d | 126,689 | 101,571 | 156,053 |

# 8.1: Explore the Ad Hoc Workspace

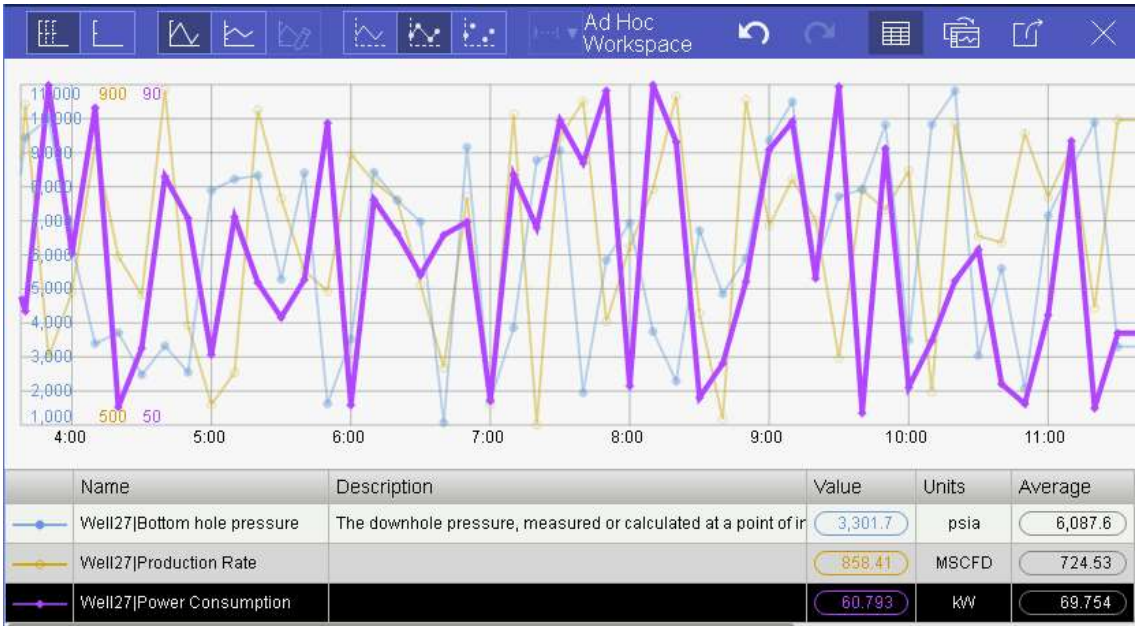
1. From the PI Vision home page open the **Oil Well Detail** display.
2. While holding the **Ctrl** key, click on the Trend and Radial Gauge symbols and then the **New Ad Hoc** Trend button in the top right:

3. Toggle between the different **Scale** and **Range** settings in the top left:



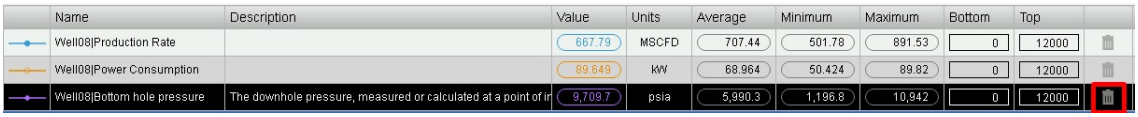

| | Name | Description | Value | Units | Average |
|---|---|---|---|---|---|
| | Well27\|Bottom hole pressure | The downhole pressure, measured or calculated at a point of ir | 3,301.7 | psia | 6,087.6 |
| | Well27\|Production Rate | | 858.41 | MSCFD | 724.53 |
| | Well27\|Power Consumption | | 60.793 | kW | 69.754 |

4. Highlight traces by selecting rows in the **Summary Table** at the bottom of the window:




| | Name | Description | Value | Units | Average |
|---|---|---|---|---|---|
| | Well27\|Bottom hole pressure | The downhole pressure, measured or calculated at a point of ir | 3,301.7 | psia | 6,087.6 |
| | Well27\|Production Rate | | 858.41 | MSCFD | 724.53 |
| | Well27\|Power Consumption | | 60.793 | kW | 69.754 |

5. Remove the **Bottom hole pressure** trace by clicking the trash can graphic:



| | Name | Description | Value | Units | Average | Minimum | Maximum | Bottom | Top | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Well08\|Production Rate | | 667.79 | MSCFD | 707.44 | 501.78 | 891.53 | 0 | 12000 | |
| | Well08\|Power Consumption | | 89.649 | kW | 68.964 | 50.424 | 89.82 | 0 | 12000 | |
| | Well08\|Bottom hole pressure | The downhole pressure, measured or calculated at a point of ir | 9,709.7 | psia | 5,990.3 | 1,196.8 | 10,942 | 0 | 12000 | |

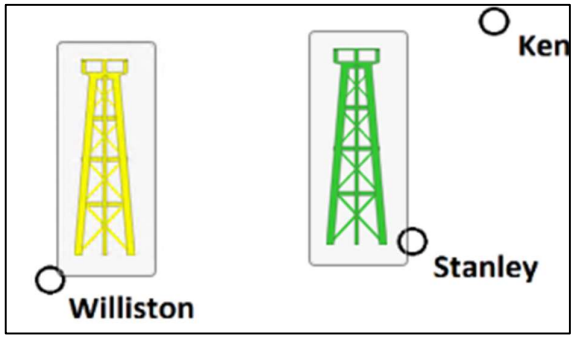
6. Click anywhere in the trend, see how a trend cursor appears. Click again somewhere else to add another cursor (you can repeat this to add multiple cursors in the trend).

7. Select any of the recently added trend cursors, drag it to the right or the left and see how the trend cursor values update as you drag it across the trend area.

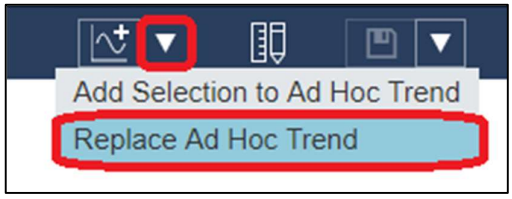
8. Close the Ad Hoc Workspace with the **Hide** button in the top right

# 8.2: Add Data from Multiple Sources to Ad Hoc Workspace

1. Click the **Back to Overview Display** link to open the **North Dakota Overview** display.
2. While holding the **Ctrl** key, click the **Oil Rig** graphics next to **Williston** and **Stanley**



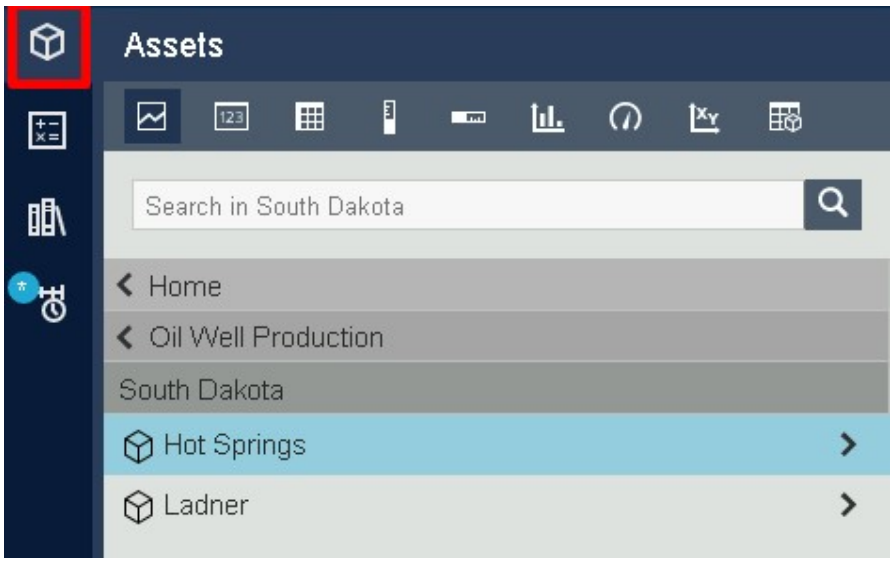

3. Open the **Ad Hoc Trend** dropdown menu in the top left and then select **Replace Ad Hoc Trend**:



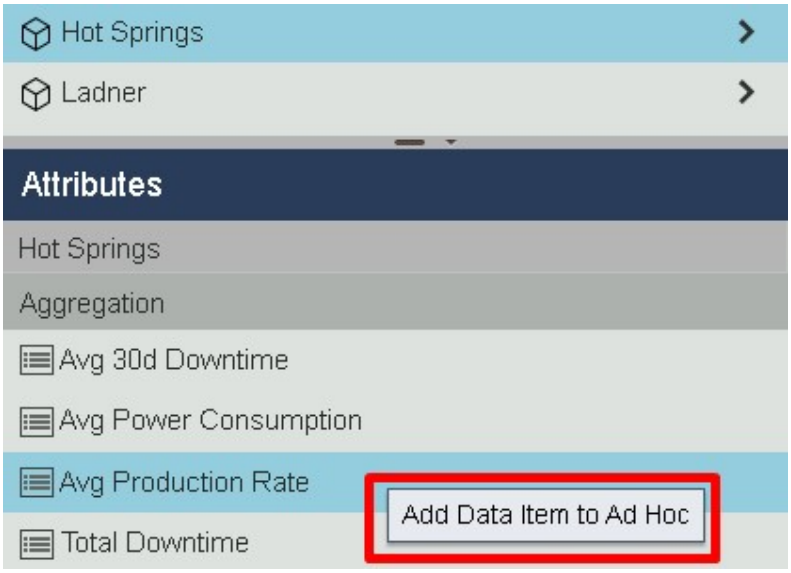

4. In the top right, toggle off the **Summary Table**

5. Close the **Ad Hoc Workspace** by clicking the **Hide** button

6. Open the Asset Pane and drill down to the **Hot Springs** element under **South Dakota** in the **Oil Well Production** database:

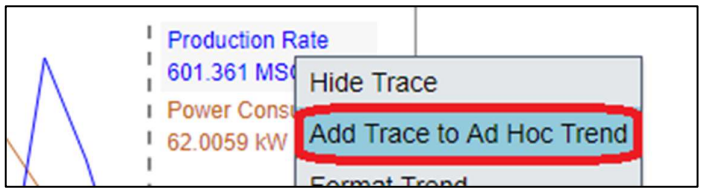


7. With **Hot Springs** is still selected, right-click the **Avg Production Rate** attribute in the bottom part of the pane and click **Add Data Item to Ad Hoc**:



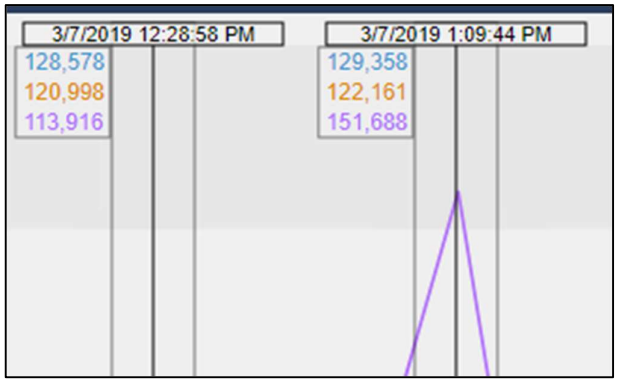

8. Click on **Well63** in the Asset Comparison Table to open the **Oil Well Detail** display:

9. Right-click on the **Production Rate** trace in the trend legend and select **Add Trace to Ad Hoc Trend**




10. Reopen the **Ad Hoc Workspace** by clicking the **Ad Hoc Trend** icon in the toolbar:

11. Click anywhere in the trend area to add trend cursors that display the exact value of each trace at a specific moment in time:



## 8.3: Export Ad Hoc Workspaces

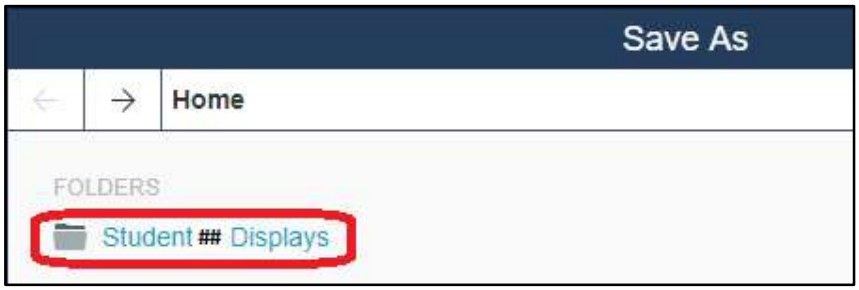
1. From within the **Ad Hoc Workspace** click the **Share** button and then the **Copy** button to load the clipboard with a URL that will regenerate the existing workspace:

2. Open a new browser tab by clicking the plus icon on the top left, paste (Ctrl + V) the URL from the clipboard, and hit the **Enter** key:

3. Close the new browser tab and return to the original tab with the **Ad Hoc Workspace** open
4. Click the **Summary Table** button to toggle the table back onto the **Ad Hoc Workspace**

5. Click on the **Convert** button to place the **Ad Hoc Workspace** contents into an **Editor Display** that can be permanently saved and shared:

6. Click on the Save drop-down menu and select **Save As**
7. If it is not already selected, click on the display folder for your user account:




8. Name the display “Production Anomaly Data” followed by your initials. For example: *Production Anomaly Data_<your initials>*.
9. Adjust any formatting as needed and save the changes.

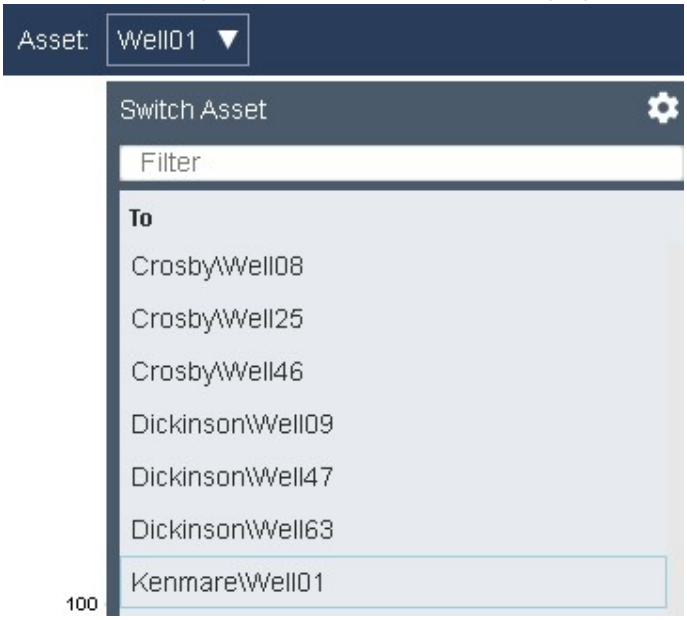
# (Optional) Challenge 9: Compare Downtime Events

A new type of request has come in from a member of the engineering team. They would like to compare the time series data that occurred during two different times that oil wells were down. Specifically, there were events on Well01 and Well16 that seemed very similar and the team would like to take a closer look.

The engineering team has correctly noted that is not possible to overlay timeseries data on standard PI Vision dashboards and has asked if there are any workarounds. Luckily, you just came across the documentation of Event Comparison displays so you know how to do this.

## 9.1: Compare Events from the Event Details View

1. From the PI Vision home page, open the **Oil Well Detail** display.
2. Use the Asset drop-down menu to switch the display asset context to **Well01**:

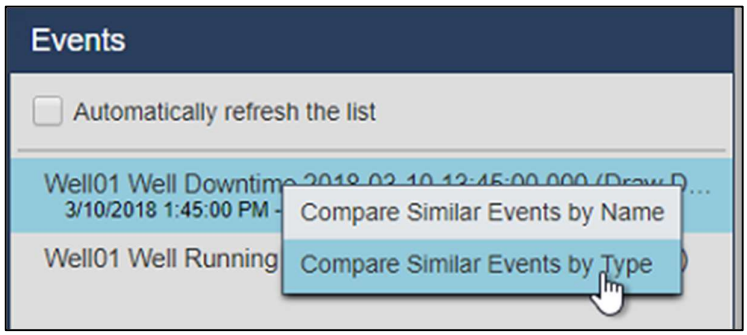



3. Double-click on the most recent Downtime event in the Events Table symbol to open the **Event Details** window:

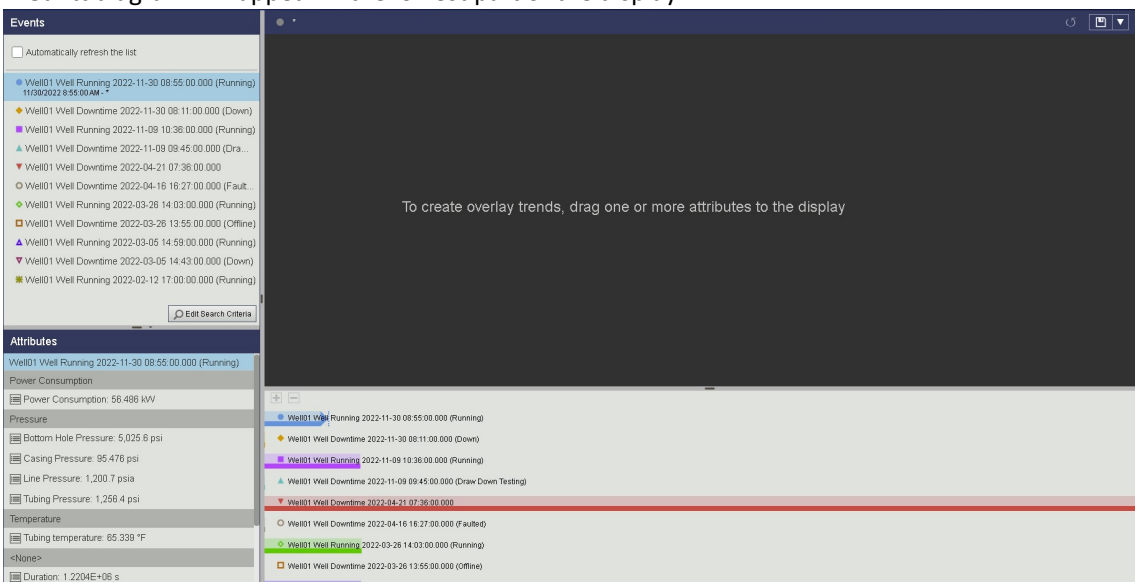
**Note**:

Alternately it is possible to view the event details by right-clicking on an Event in the Events Pane. Events will automatically populate this list if any of the assets on the display have active events within the time range of the display. It is also possible to manually search for Events by modifying the Search Criteria.

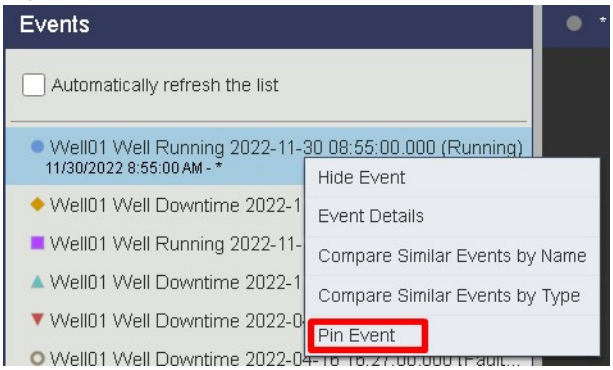
4. Right-click on the Downtime Event and select **Compare Similar Events by Type**:



5. A Gantt diagram will appear in the lowest part of the display:

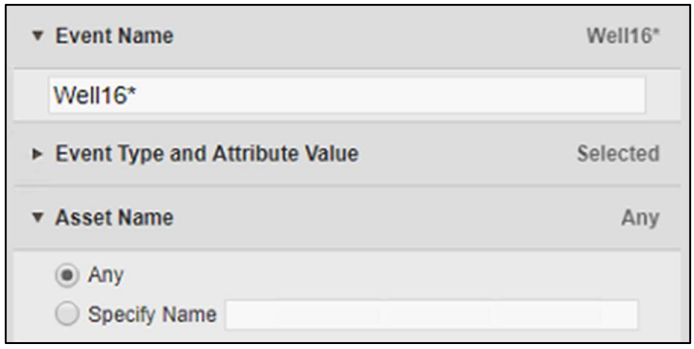



6. Right-click on the same Downtime event and select **Pin Event**




7. Click on **Edit Search Criteria** to open the search criteria:

8. Set the Event Name filter to “Well16*”, the Asset Name filter to “Any”, and then click **Apply**:




9. Click and drag the **Casing pressure** and **Tubing pressure** attributes onto the display (**Hint**: you can drag and drop them individually into the same trend or if you click and hold **Ctrl** in your keyboard you can make multiple attribute selection).
10. Change line style for Tubing pressures’ attributes:
    - In the trend created in Step 9 click on the gear icon
    - Click on the Tubing pressure attribute
    - Change the line style at the line style drop down menu
    - Once the changes have been made, click on the gear icon again to exit Trend configuration settings

11. Save the display as “*Downtime Event Comparison*” followed by your initials.

# (Optional) Challenge 10: Manage PI Vision Displays and User settings

Now that you have seen how to create displays within PI Vision, you may wonder how to keep track of and manage a large number of displays.

## Role-Based User Access

PI Vision provides for two different user roles to facilitate system manageability. The two types are:

**Publisher**

- Designed for subject matter experts and content creators.
- May create and save new dashboards and analysis views.
- Equivalent to the traditional PI Vision User in previous versions.

**Explorer**

- Can use the full power of existing displays, including context and time manipulation
- Can create ad-hoc displays
- May not save any new displays or changes to existing displays

Users are assigned roles on an AF Identity basis. The PI Vision Admin site is used to manage these settings.

**Note**:

For security and organizational purposes we recommend separating users into Publishers and Explorers. However, these designated access groups are not mandatory and the universal PI Vision User role may still be used. Use the PI Vision Admin site to manage these settings.

## Display Folders

Another thing to note is that PI Vision allows the use of display folders to organize displays and to manage user access.

- Users can be set to have read permission to the displays contained within specific folders.
- As appropriate, users can also be given permission to edit the displays within a folder and/or add new displays to folder.

PI Vision administrators can control access to these folders on an AF Identity basis from the PI Vision home page.

# 10.1: Finding and Categorizing Displays

1. PI Vision allows you to add keywords to displays so that they can be organized into one or more groups. To add a keyword to a display, select its gear icon from the PI Vision home page:

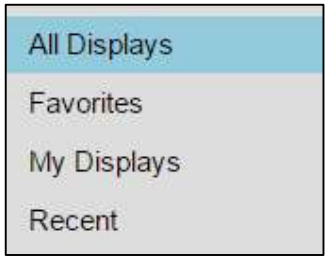
   This will bring up the display settings dialog that you can use to manage displays you have created. You may add keywords here to help organize your displays. Simply type any text you like into the Keyword box. To add multiple labels at a time, separate them with a semicolon.
2. Once you have added a few labels, click **Filter by Keywords** on the homepage.

   This will bring up a tag cloud of the keywords that have been created on this server. The cloud is weighted so that labels that appear more in displays will be larger. Clicking a label from within the cloud will filter the list of displays to only those which have the selected label.
3. Another way to filter is by clicking the **Related Displays** button.

   This shows all displays that contain any of the keywords associated with the selected display.
4. In addition to keywords, you can also mark a display as a favorite by clicking the star under a display.

5. Using the navigation pane you can filter displays to see only Favorites, displays that were created by you, or displays that you have recently viewed.

# 10.2: Controlling Access to a Display

1. When you create a display, it will initially be set to Private, denoted by the single person icon on the PI Vision Home Page.

2. If you would like to share a display that you have created, click the gear graphic to open the Display Settings menu and then click an identity under **Unassigned AF Identities** and then click **Add Permissions** to grant that AF Identity access to this display.

   When you grant access to a display for an AF Identity, you can specify the type of access that you want to grant.

   - **Read** access: Grants an AF Identity the ability to see and open the display.
   - **Write** access: Grants an AF Identity the ability to save changes to a display.

   By default, each added AF Identity receives **Read** access to the display. To grant the AF Identity **Write** access for this display, select the **Write** check box.

   After at least one group is selected, the display will change to Public, denoted by the three-person icon on the home page.

3. Also available is the option to make the display Read-only, which will prevent other users from making any modifications to the display.
4. The display owner is located below the display name. If needed, the display owner can be changed by PI Vision administrators

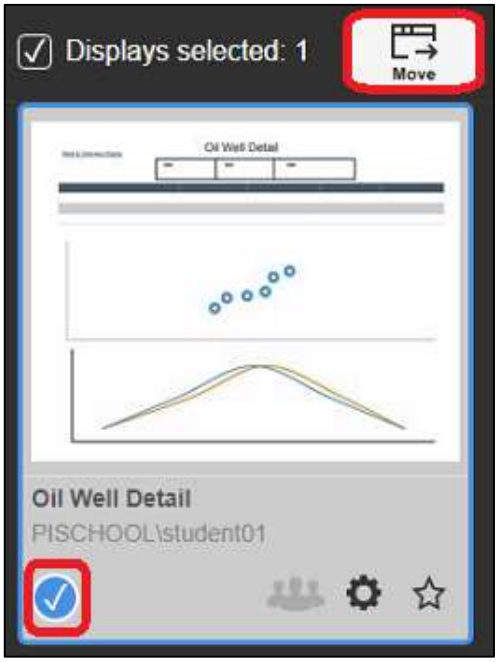
   

5. You can also delete your display using the **Delete display** button

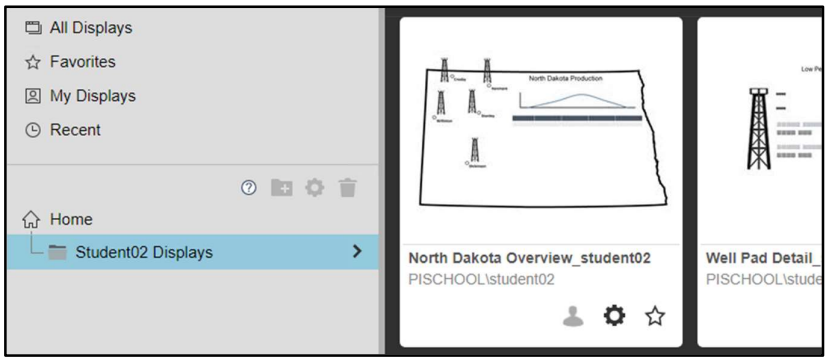
# 10.3: Organizing Displays with Folders

1. To move a display to a folder, first hover over the display and click the checkmark in the bottom left corner to select it. Then, click the Move button and select a destination folder



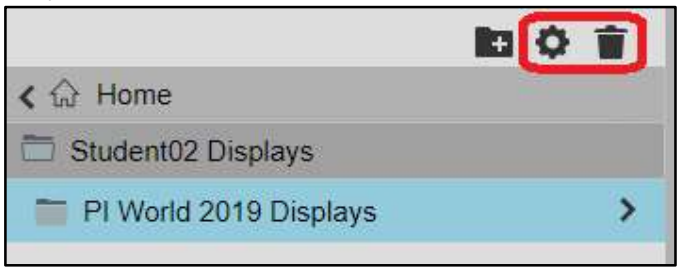

2. On the bottom left section of the home page, you will see the Display Folders for which you have permission. At the root level, the folder configuration buttons will be grayed out unless you are a PI Vision administrator

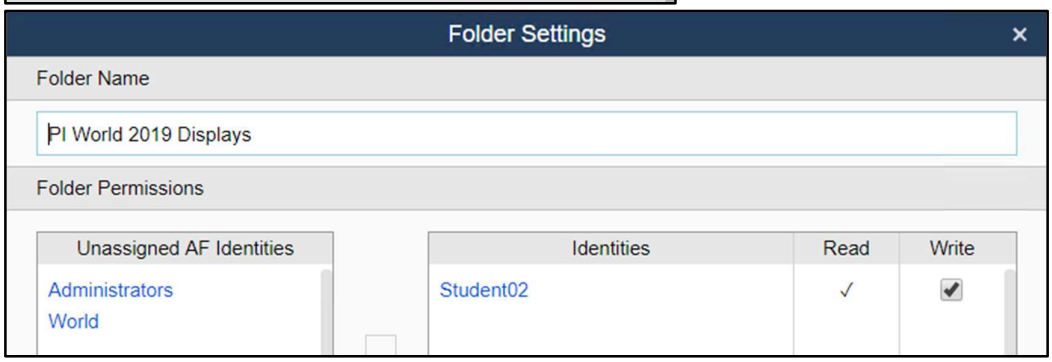
3. When you select a Folder, you will see the displays within it to which you have permission




4. Since you have write permission within the Display Folder created for your user account, you may add child folders. Click on the **Student## Displays** folder and then click on the new folder graphic.

5. Since you have write permission at the parent level of this new child folder, you may manage the permissions on the folder or delete.



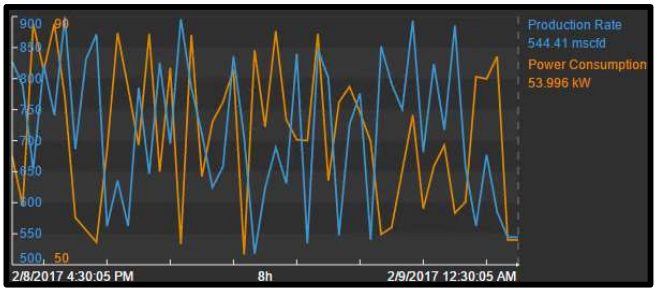

If you delete a Display Folder, any subfolders will also be deleted. Any displays in the selected folder or subfolders will be moved to **Home**, the root level above any display folders.

# Appendix

## Interacting with Data Symbols

In PI Vision, data is visualized with symbols. Below are the nine built-in symbols included with every installation of AVEVA PI Vision 2022:

### *Trend*

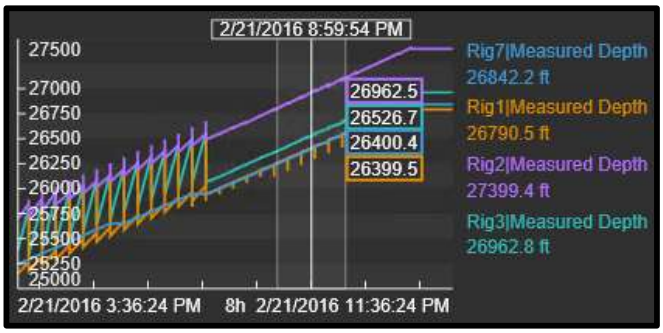



When in Design Mode, right-click on the trend and select Format Trend in order to bring up the design options for the trend

- Trend Options are used to change the Foreground and Background colors, choose between single or multiple scales, and set the scale range
- Trace Options allows you to customize the color, weight, style, and scale range of individual traces. You can also delete traces from this section
- The Use Default Settings button allows you to reset all trend options

In Monitor Mode, use the bottom third of the trend area to shift the time context of the trend

When in Monitor Mode you can add a cursor by simply clicking on the trend. A cursor automatically populates on all trends within that display. Drag the cursor to change positions, and drag it off of the trend in order to get rid of it.




In Monitor mode, click on the data item in order to highlight it on the trend

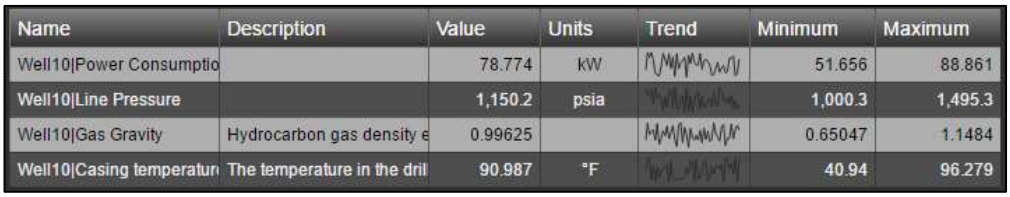
### *Value*

The Value Symbol populates with the asset name, timestamp, UOM, and value:

Format the Value by right-clicking on the value and selecting Format Value. This allows you to change the Fill, Text, and Value color as well as changing what attributes are displayed within the Value symbol

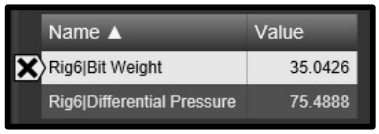
### *Table*

The table symbol displays multiple attributes or PI Points concisely in a table format



| Name | Description | Value | Units | Trend | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Well10\|Power Consumptio | | 78.774 | kW | | 51.656 | 88.861 |
| Well10\|Line Pressure | | 1,150.2 | psia | | 1,000.3 | 1,495.3 |
| Well10\|Gas Gravity | Hydrocarbon gas density e | 0.99625 | | | 0.65047 | 1.1484 |
| Well10\|Casing temperatun | The temperature in the dril | 90.987 | °F | | 40.94 | 96.279 |

- Add data items to the table by dragging the data item onto the table
- Get rid of data items by clicking on the row of your choice and then clicking the delete button

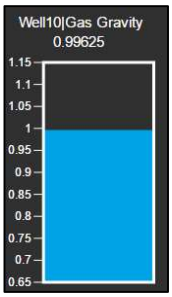


| Name ▲ | Value |
|---|---|
| Rig6\|Bit Weight | 35.0426 |
| Rig6\|Differential Pressure | 75.4888 |

- If you select a data item in a table you can then drag that data item onto a trend in order see historical values
- Dragging a data item off of a table onto a blank space in the display will create a separate object for that data item while in display monitoring mode. The object type will depend on which symbol is selected above the search pane.
- Right-click on the table and select 'Table Columns' to pick which columns to display

### *Vertical and Horizontal Gauges*

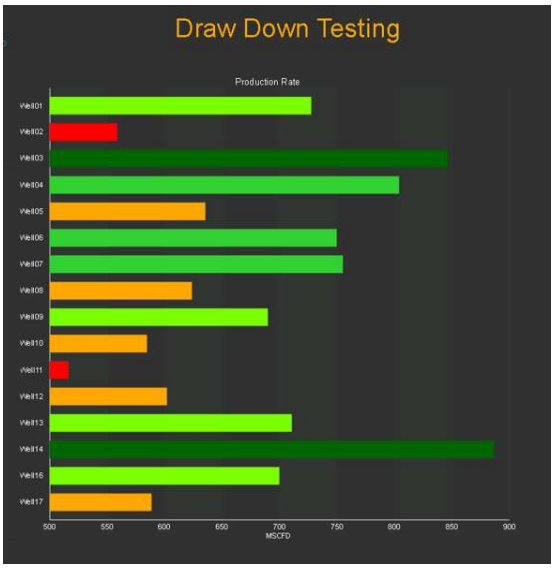
The Vertical and Horizontal Gauges display a singleton in a bar format:




You can format the Bar, Fill, Outline, and Value color, Outline weight, and Visibility of the Vertical Gauge by right-clicking on the gauge and selecting Format Gauge

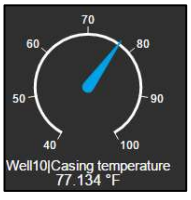
### *Bar Chart*

Use a bar chart symbol to compare multiple values through graphical representation. Bar charts are often used to compare multiple data sources, where one bar represents one data source. A data source could be from PI, from AF, or a calculation.




### *Radial Gauge*

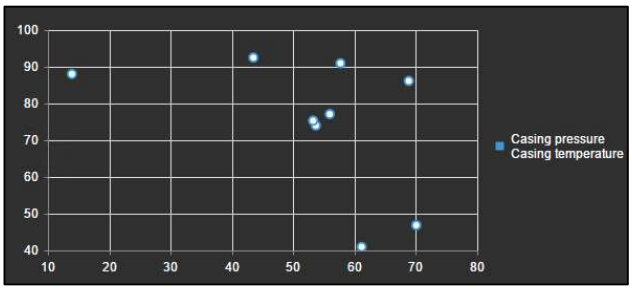
The Radial Gauge symbol displays a singleton in a gauge format:




Right-click on the gauge and click Format Gauge to bring up the possible format options. Here it is possible to change the stylings, visibility, and Scale start and end of the gauge

### *XY Plot*

The XY plot displays a graph of plotted points that helps to show if a relationship exists between sets of data




Right-clicking on the XY plot and selecting Format XY Plot allows for the customization of the Source data, associated X and Y scales, as well as general styling of the XY plot.

### *Asset Comparison Table*

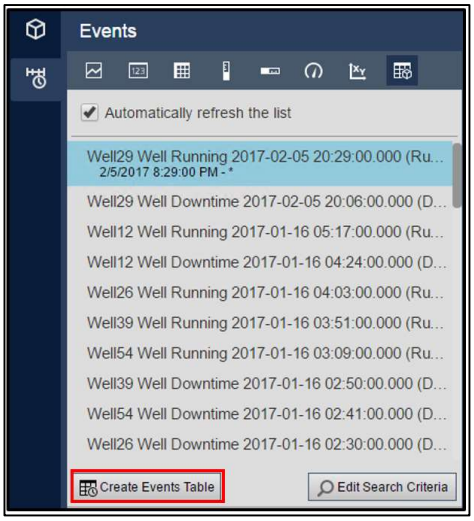
If the same attributes exist for multiple Elements, the Asset Comparison table allows us to display them all in a single table:

| Asset | Bottom hole pressure | Casing pressure | Casing temperatu... | Gas Gravity |
|---|---|---|---|---|
| Well06 | 2,450.6 | 42.19 | 68.595 | 1.0575 |
| Well10 | 3,667.3 | 55.874 | 40.802 | 0.76351 |
| Well23 | 6,718.9 | 50.124 | 51.177 | 0.72927 |

Right-click on the Asset Comparison table and select Format Table in order to select which attributes and assets to display in the table

### *Events table*

The Events Table button is available in the Events Search Pane




It creates a dynamically updating table of current events

| Event Name | Asset | Start Time | End Time |
|---|---|---|---|
| Well29 Well Running 2017-02-05 20:29:00.000 | Well29 | 2/5/2017 8:29:00 PM | In Progress |
| Well29 Well Downtime 2017-02-05 20:06:00.000 | Well29 | 2/5/2017 8:06:00 PM | 2/5/2017 8:29:00 PM |
| Well12 Well Running 2017-01-16 05:17:00.000 | Well12 | 1/16/2017 5:17:00 AM | 2/3/2017 12:07:01 AM |

Right-click on the Events Table and click on Table Configuration to edit the Table Columns and Dynamic Criteria that determine which events to show.

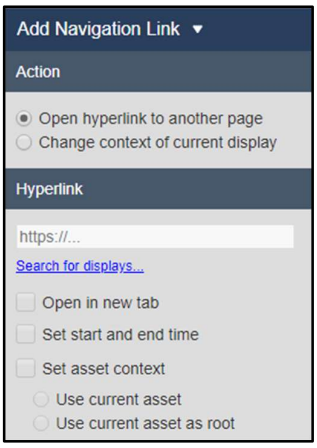
### *(Context Option) Multi-Stating*

Value symbols and all Gauge Symbols can be modified to become multi-state symbols

Right-click on the symbol and select Add Multi-State in order to configure the Multi-State symbol. The trigger tag and states can be configured here

### *(Context Option) Navigation Links*

Every symbol can be configured with a navigation link. Navigation links allow users to link from one PI Vision display to another, from a PI Vision display to a separate website, or change the asset context of the current display:



Navigation links are activated by clicking on those symbols configured to use them.

*(Context Option) Collections*

- Every symbol has the option to convert it to a collection
- A collection is a dynamically updating group of symbols that leverages Element templates in AF

*(Context Option) Switch Symbol*

- Each symbol has a menu option that allows a user to switch a symbol into a different type of symbol
- This saves a user from having to recreate a symbol from scratch if they would like to change the symbol type

*Ad Hoc Trend Workspace*

- Selecting any number of symbols and/or data items and then the Ad Hoc Trend button will open a new window designed for Ad Hoc analysis
- Optionally view a table with statistics for all data items
- Toggle Trend options with single clicks without navigating a configuration menu
- Add multiple cursors to the trend
- Publish as a display and share with other users

*Asset Dropdown*

Opening the Asset dropdown menu gives a list of possible Assets to which the display context could be switched

If the list of Assets is very long, it is possible to enter a filter:

By default, the menu will populate with similar Assets to the current context. If appropriate, click the gear button to customize the Asset search criteria.

# References

Consult these resources for assistance with PI Vision that can be found in https://my.osisoft.com and https://docs.osisoft.com/.

# Final Exam

The final exam in this course is taken online. Please check the course listing online for more detail.