TRAINING GUIDE

PM Advanced

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Advanced PM Training

The *Work PM/Template* module allows you to create four different kinds of advanced PMs (Preventative Maintenance jobs): Grouped PMs, Grouped Asset PMs, Tightly Linked PMs, and Tightly Linked Group PMs. We'll discuss each of these four PM types in this workbook, as well as show in-depth examples to demonstrate how they're created, how they work, and how they interact with the *Work Orders* module.

> *Note: These Advanced PM topics rely on a basic understanding of the PM/Template system. For additional information on PM/Templates, please refer to the Basic PM Training workbook or the Lucity help guide.*

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Grouped PMs

The first type of advanced PM we will discuss is the Grouped PM. This is a type of scheduled PM. Remember, we covered scheduled PMs in the *Beginning PM Training* workbook. By selecting the **Scheduled PM** checkbox and the **Grouped PM** checkbox in the header, you gain access to the PM **Groups grid**. This grid will then be used to group assets together and set up PM schedules. You won't be using the **PM Asset** grid or Schedule fields on the PM/Template Form for this type of PM

The PM **Groups** grid provides you with the ability to create one PM record for multiple assets. You can then generate multiple work orders for separate assets on the same schedule using the same template. In other words, instead of creating five separate PM/Templates with the same category, problem, tasks, resources, checklist items, etc., you can create one PM/Template and then include all assets that need that type of routine work done. Then, you can create multiple work orders for those assets based on the single PM/Template you created.

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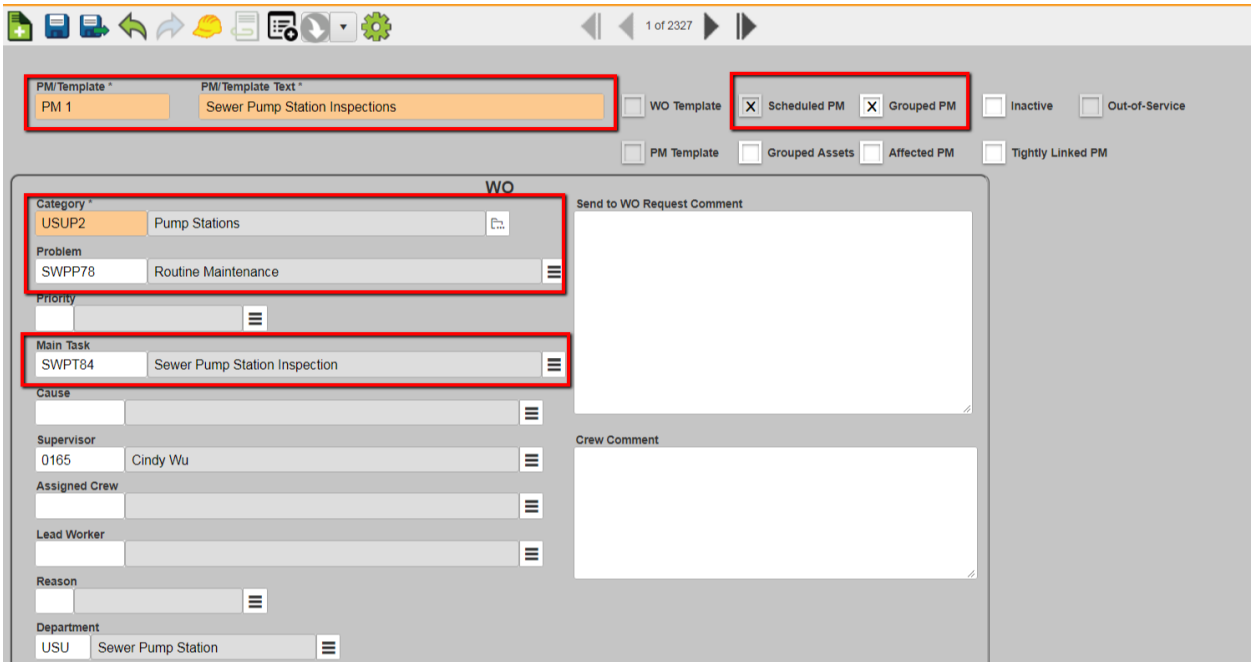
To help you create a PM for a group of assets, we'll go through a step-by-step example.

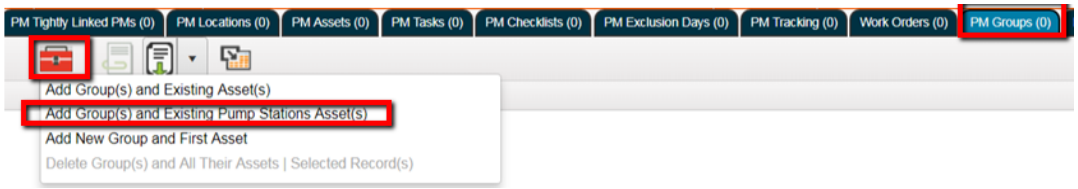
Let's assume you have a preventative maintenance task where you perform routine pump station inspections. You'd like to set up a bi-annual schedule for each pump station in your network, but would like to inspect the various pump stations in different months throughout the year. You'd also like to use the same tests, crews, and resources on each pump station inspection. In order to do this, you'll create one template for this PM that includes all of your pump stations, along with the tasks and resources needed to complete the inspections. Then, you can create individual PM schedules for each pump station, allowing you to generate separate work orders for each.

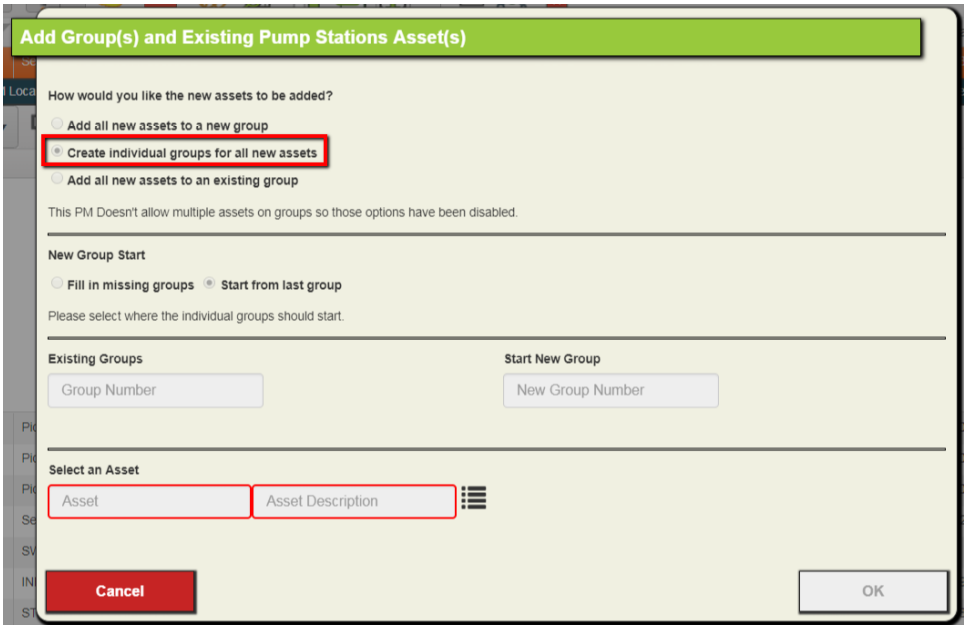
1. Create a new PM record.
    - Enter a unique PM/Template code-description in the header. We've titled this example, "Sewer Pump Station Inspections".
    - Select a related Category, Main Task, and Problem.
        - As you can see in the example below, we've chosen "Sewer Pump Station", "Pump Station Inspection", and "Routine Maintenance" as the Category, Main Task, and Problem, respectively.
    - Select the Scheduled PM checkbox. This distinguishes the PM record from a Work Template.
    - Select the Grouped PM checkbox. This allows you to create one PM for multiple assets. It also gives you access to the PM **Groups grid**.

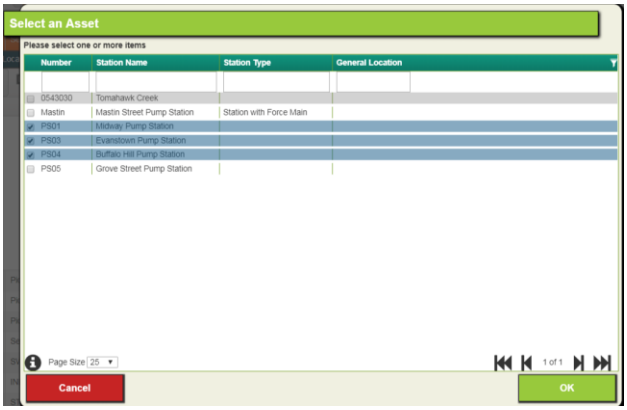


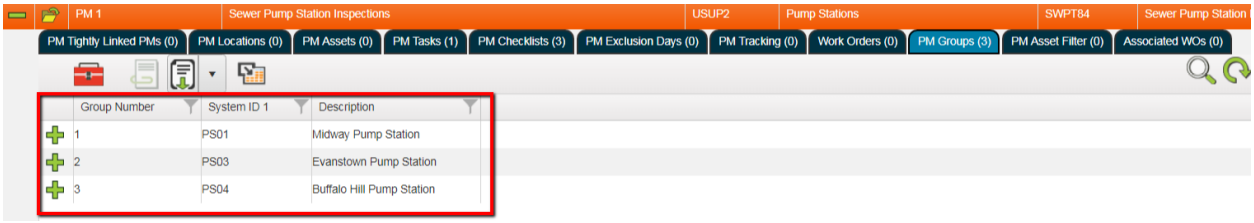
2. Add all checklist items, tasks, and resources needed to complete the pump station inspections.

3. Add your Pump Station assets to the Grouped PM.
    - You will use the PM **Groups** grid to include assets. You will not use the PM Assets grid for this type of PM.
    - In our example, we will use the Toolkit Option Add Group(s) and Existing Pump Station Assets(s) to select the pump stations.
        - To load these assets, select the Toolkit Option Add Group(s) and Existing Pump Station Assets(s) within the PM Groups Grid.
        - From the Toolkit dialog, select the assets and click *Ok*.
        - The assets from that dialog will be added to the PM Grouped Assets grid. Each asset will be given its own unique PM Group ID.









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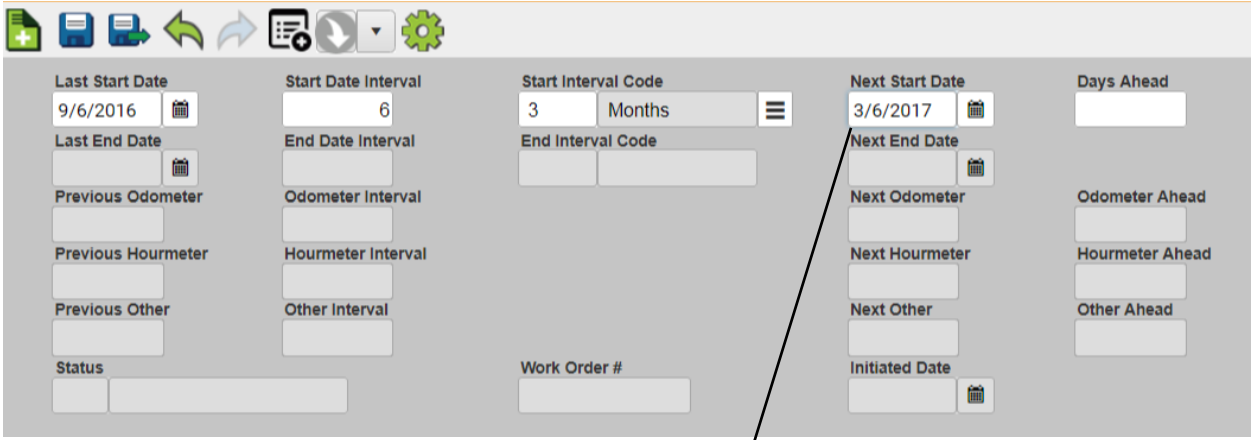
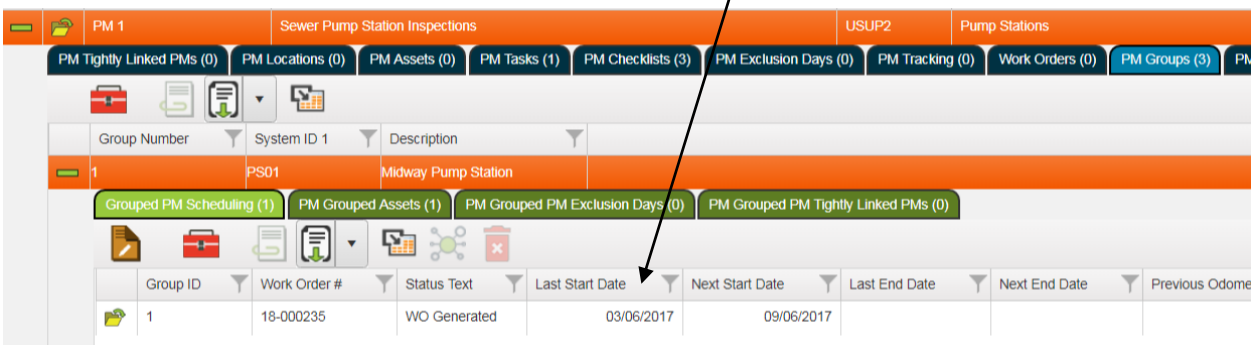
4. Schedule your PMs.
   - You will use the **Grouped PM Scheduling** grid to schedule your Grouped PM. You will not use the Schedule Fields on the PM/Template form for this type of PM.
   - Select the plus icon  beside the asset for which you would like to set up a PM schedule.
     - The Grouped PM Schedules grid only displays schedules for the highlighted assets.
   - Select the Toolkit in the Grouped PM Schedules grid and select *Add New Schedule*.

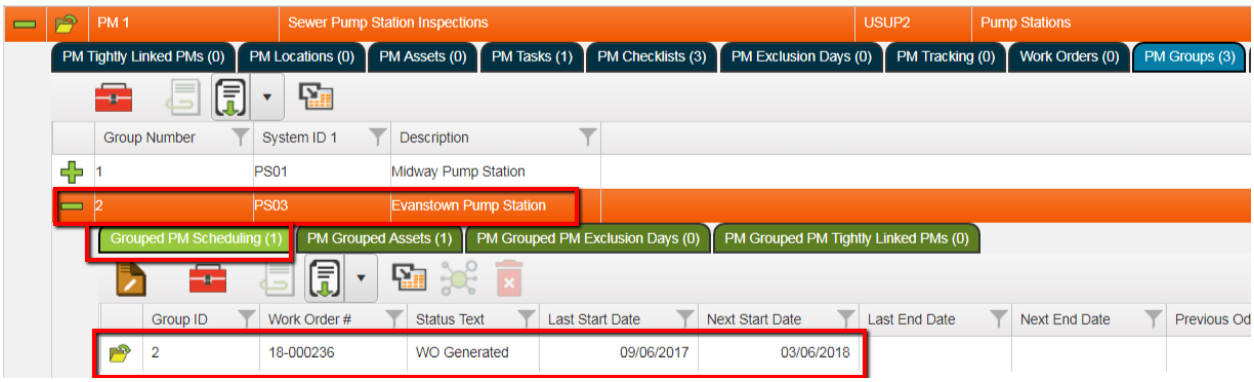
   - Determine whether you would like to use a **fixed** or **floating** schedule:
     - A **Fixed Schedule** generates a work order based on the Next Start Date. This type of PM will generate at a fixed interval regardless of when the last job was completed. For example, if you have a weekly work order that generates on a Monday, the next new work order will be generated the following Monday even if the last job wasn't finished until Thursday.
     - A **Floating Schedule** generates a work order based on the Last End Date. In the same example as above, if a work order was generated on Monday for your weekly task, but you didn't finish the wok order until Thursday, your next work order will not generate until the following Thursday.

- In the example below, we have set up a fixed schedule based on the last start date of the work order (using the PM Last Start Date field).
- Next, select the interval for the next PM to be generated. In other words, select the time lapse between each work order generation.
    - We have set a 6 month interval for work order generation.
- Click in the Next Start Date field and the date will automatically be populated based on the start date and the selected interval.
- Repeat this scheduling process for each pump station asset in your Grouped Assets grid.



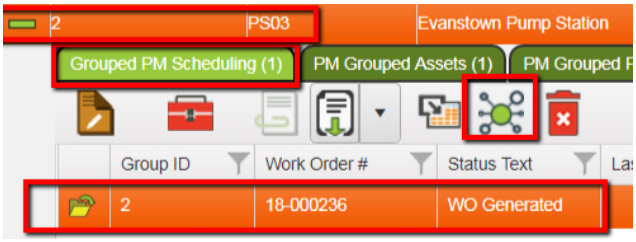
- Save the record, if the date is behind, the work order will generate and set the New last start date equal to the Next Start Date



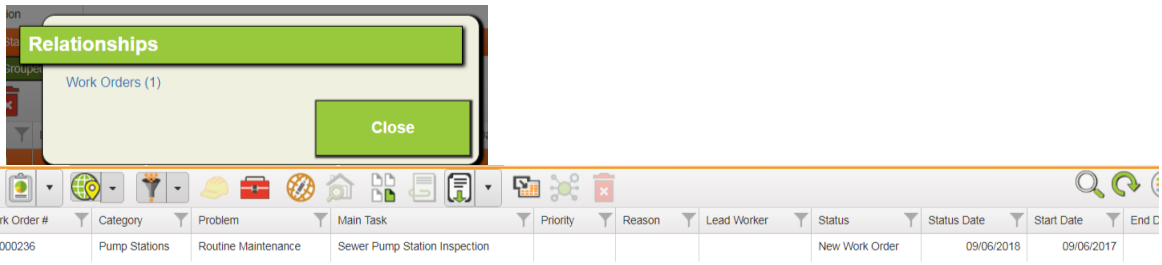


5. View the generated work order.

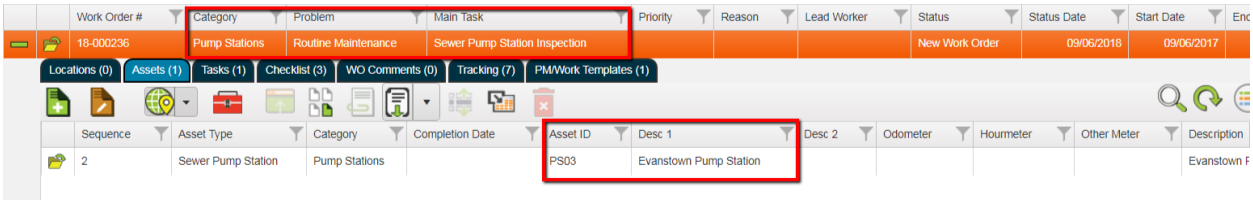
- Select the WO in the Grid, then Click on the Relationship Icon  within the Grouped PM Scheduling Grid. You will see the new work order listed.



- Click on the Work Orders(). The *Work Orders* module will open directly to that record.



- On the new work order, you will see the Category, Problem, and Main Task that you chose in the PM. Additionally, the pump station asset, checklist items, tasks, and resources will be included in the new work order. As you can see below, the single pump station asset with this PM schedule appears in the Asset Grid of the Work Order View.

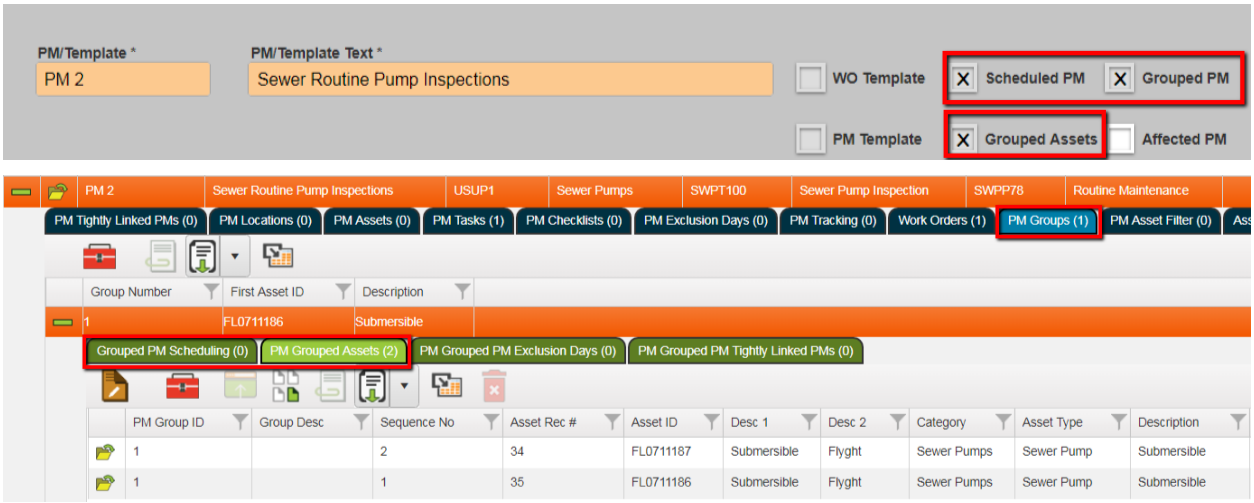


6. Close the work order by entering an End Date and setting the Status to "999-Complete". This will enable the PM to generate another work order at the next six-month interval.

Grouped Asset PMs

The second type of advanced PM is the **Grouped Asset PM**. This feature allows you to create one PM/Template for multiple assets, and then create smaller groups of those assets each with their own group PM schedule. You can then generate one work order for each group of assets using the same PM/Template. In other words, instead of creating three separate templates with the same category, problem, task, resources, checklist items, etc., you can create one template and then include all assets that need that type of routine work done at the same time. Then, you can group those assets based on when work needs to be done and create a single work order for each group of assets based on the single template you created.

By selecting the **Scheduled PM** checkbox, the **Grouped PM** checkbox, and the **Grouped Assets** checkbox, you gain access to this feature. Grouped Asset PMs use the **Grouped PMs** Grid. As before, this Grid is used to add assets and set PM schedules. The Scheduling fields on the WO form and the WO Asset view will not be used.



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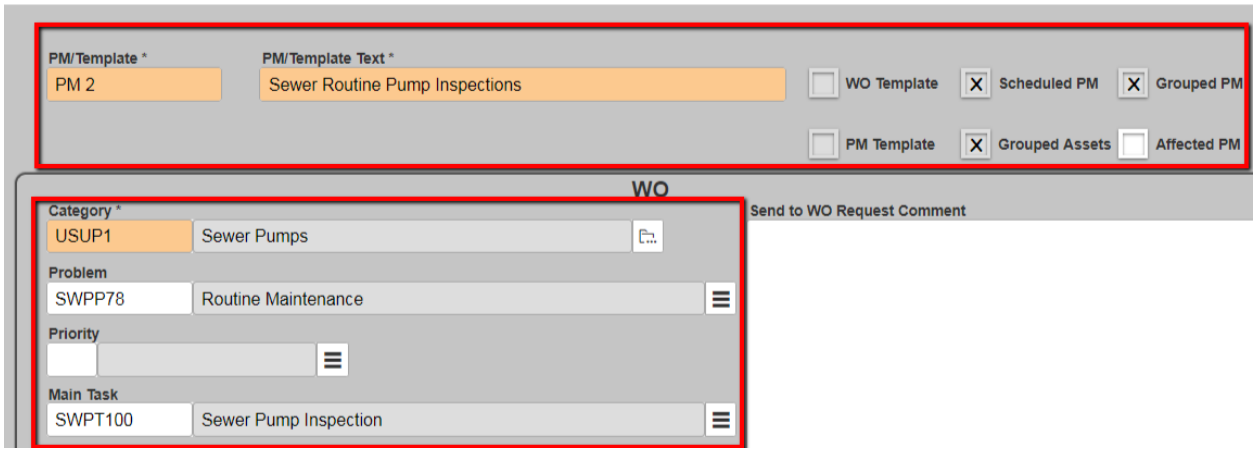
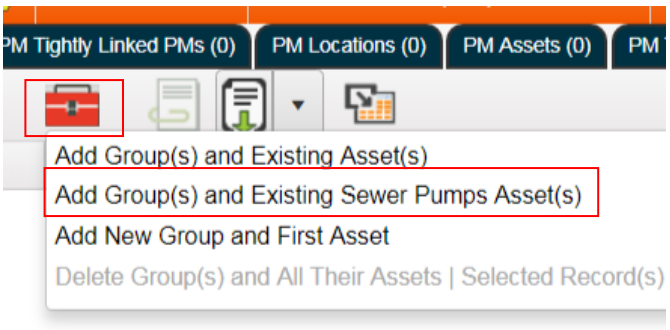
To help you create a Grouped Asset PM, we'll go through a step-by-step example.

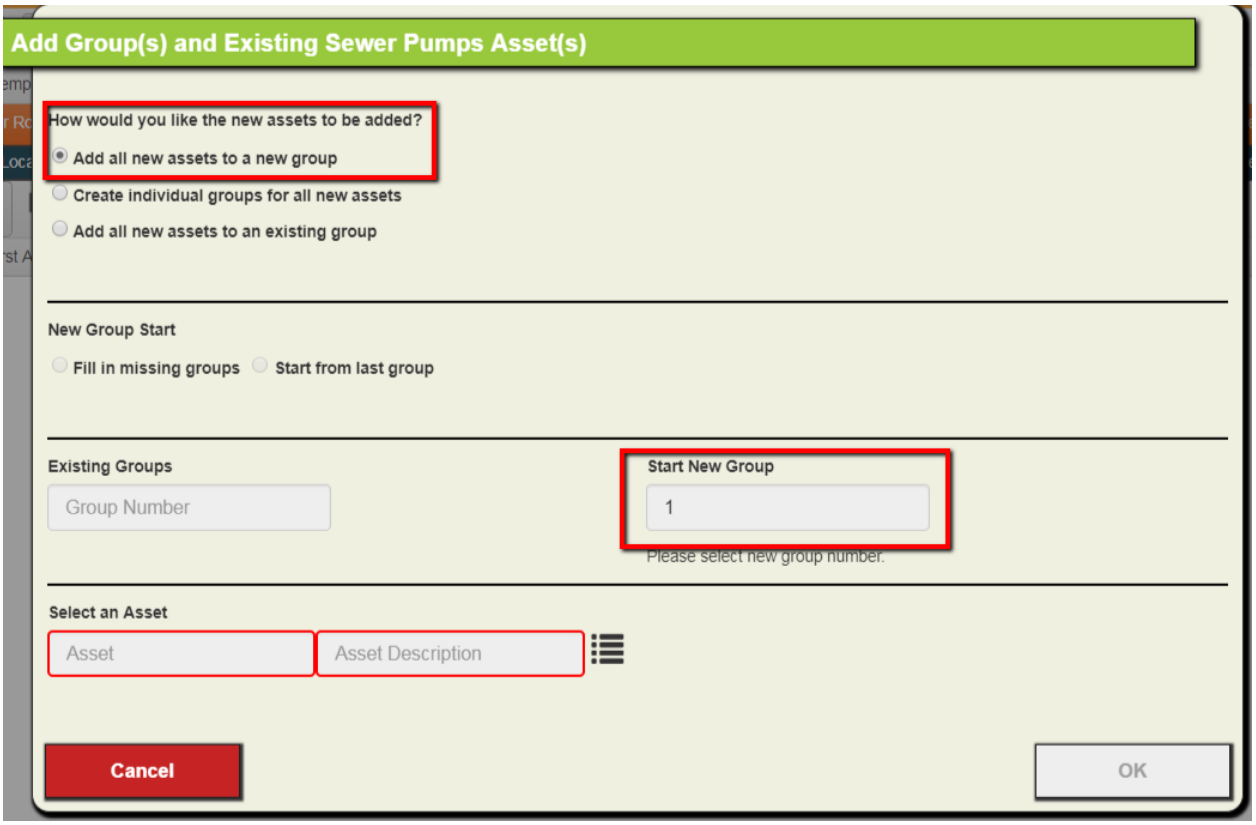
Let's assume you have a preventative maintenance task where you perform routine pump inspections. One of your pump stations stores four separate pumps. You'd like to set up a bi-annual schedule for these inspections, and would like to inspect the pumps stored in that pump station in groups of two, at two separate times of the year; however, you'd like to use the same tasks and resources to complete the inspections. In order to do this, you'll create one PM/Template for this task that includes all four pumps in the pump station. Then, you can create two separate work orders for each pair pumps using their own group PM schedules.

1. Create a new PM record.
    - Enter a unique PM code-description in the header. We've titled this example, "Sewer Routine Pump Inspections".
    - Select a related Category, Main Task, and Problem.
        - As you can see in the example below, we've chosen "Sewer Pumps", "Sewer Pump Inspection", and "Routine Maintenance" as the Category, Main Task, and Problem, respectively.
    - Select the Scheduled PM checkbox. This distinguishes the PM record from a Work Template.
    - Select the Grouped PM checkbox. This allows you to create one PM for multiple assets. It also gives you access to the **Grouped PMs** Grid.
    - Select the Grouped Assets checkbox. This allows you to create one PM schedule for multiple assets.

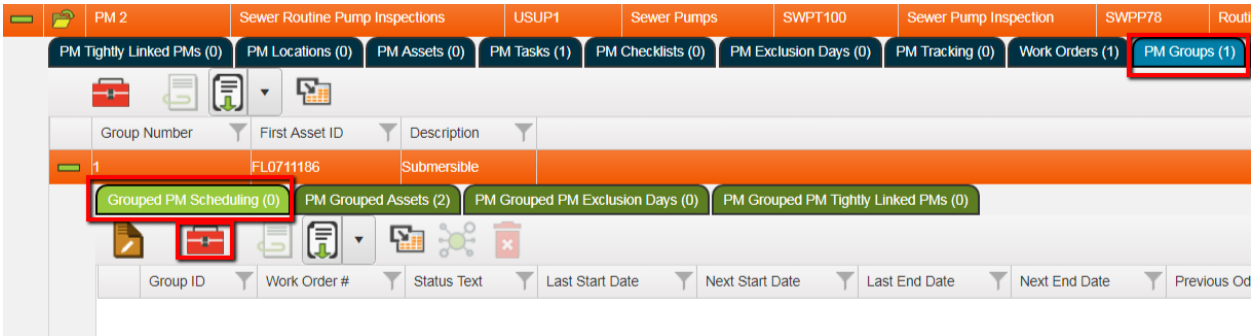


2. Add checklist items, tasks, and resources needed to complete the pump inspections.
3. Add your Pump assets to the PM.
    - You will use the **Toolkit on the PM Grouped Assets Grid** to include assets. You will not use the PM Assets Grid for this type of PM.

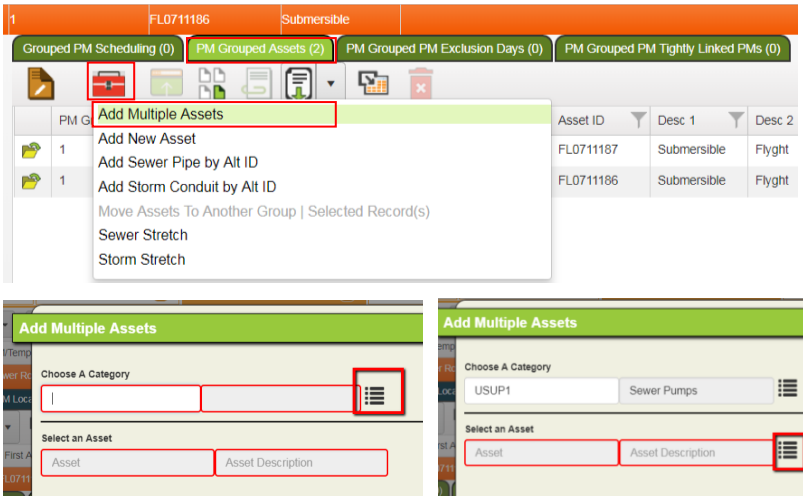




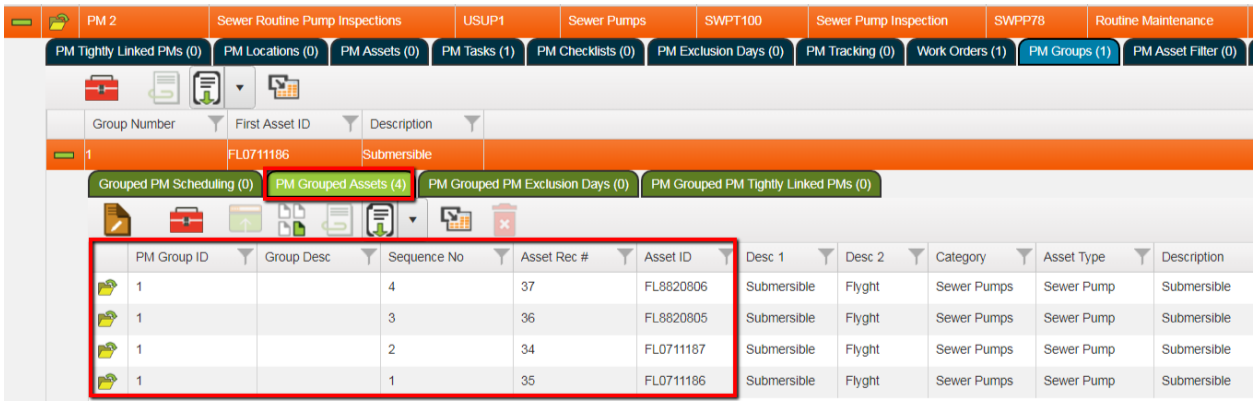
- Select the Toolkit option on the Grouped PM Schedules Grid and select *Add New Schedule*.



- You can add additional Assets by selecting the Toolkit Option Add Multiple Assets on the Grouped PM Schedules Grid, add the related assets by clicking on the checkbox next to the Asset System ID 1 button and selecting from the pick list. You'll repeat this process for each related asset.



- In our example below, we've selected four pumps housed at a Sewer Pump Station.
- Each asset will have a unique PM Group ID.



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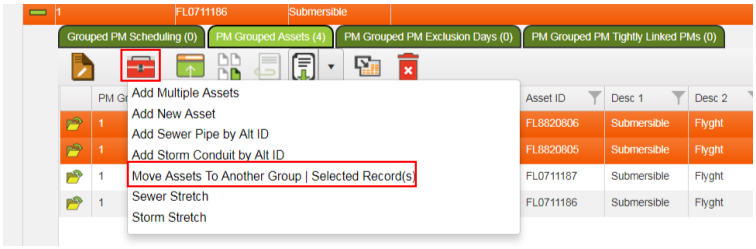
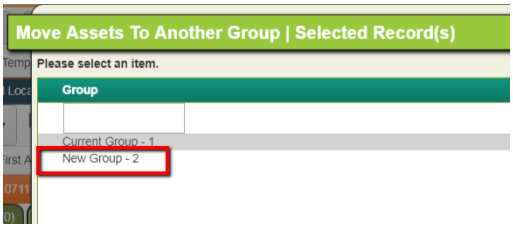
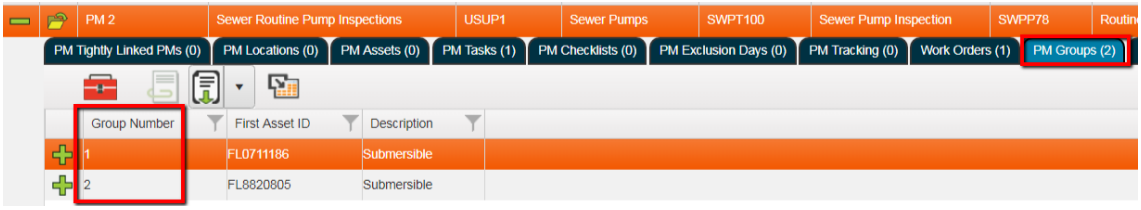
4. Group the related assets into the two pairs you would like to inspect at a time.
    - Hold down the Ctrl key and select two of the four pump assets in the Grouped Assets grid.
    - Select the Toolkit option on the PM Grouped Assets grid and select *Move Assets To Another Group | Selected Record(s)*. Right click on the highlighted assets and select *Group Assets*.

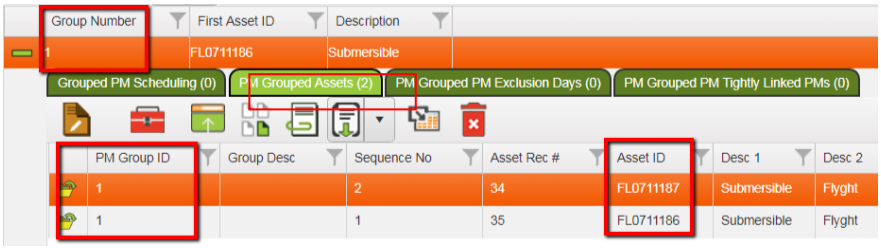


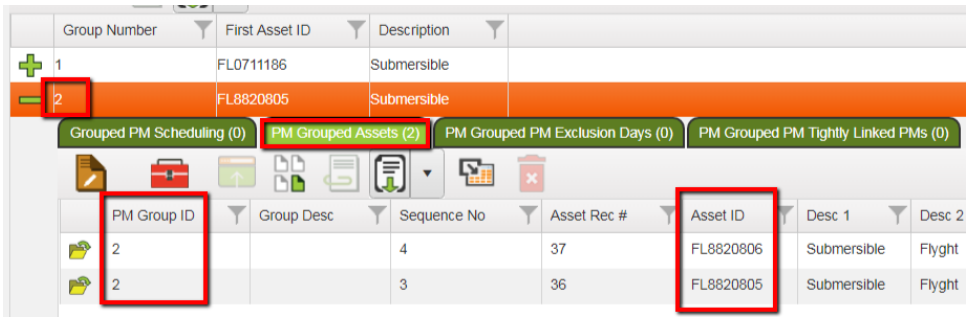


- There are now 2 PM Groups. The first pair of pump assets have PM Group ID of 1 and the second pair was given a PM Group ID of 2



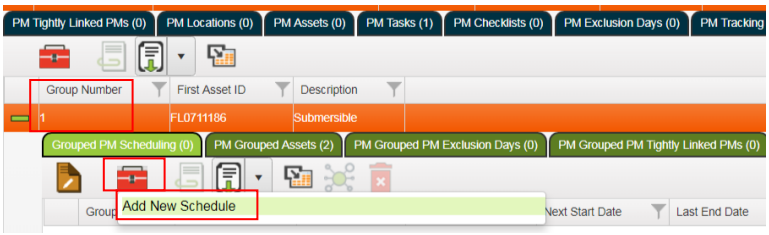
- The first pair of pump assets will be given one PM Group ID and the second pair will be given a separate PM Group ID. This allows the two asset pairs to have separate PM schedules.



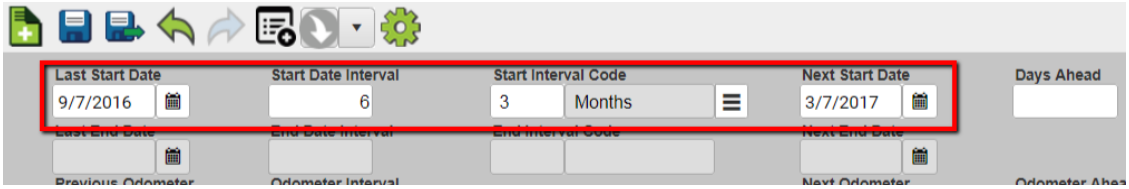


5. Schedule your PMs.

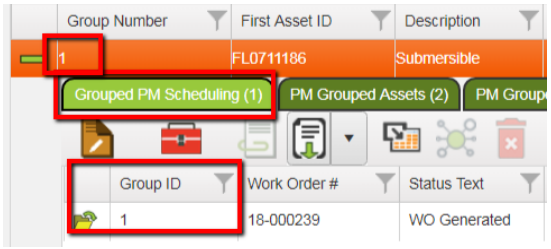
- You will use the **Grouped PM Scheduling** Grid to schedule your Grouped Asset PM. You will not use the Scheduling fields on the Work Order Form for this type of PM.
- Select the Toolkit on the Grouped PM Scheduling Grid and select *Add New Schedule*. In the example below, we have set up a fixed schedule based on the last start date of the work order (using the PM Last Start Date field).



- The Grouped PM Schedule will automatically apply to all of the assets in the selected group. Determine whether you would like to use a **fixed** or **floating** schedule. In the example below, we have set up a fixed schedule based on the last start date of the work order.We have set a 6-month interval for work order generation.



- The PM Group ID will appear in the Grouped PM Schedules grid. This identifies which assets are on this PM schedule.



- Repeat the scheduling process with the next PM group. With this type of PM, you can choose any type of schedule you'd like for the second group.

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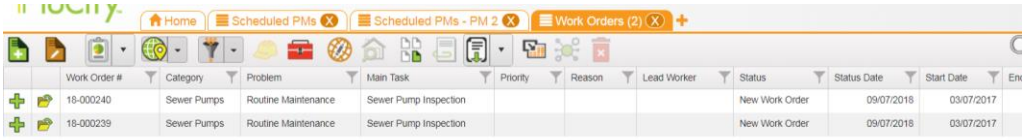
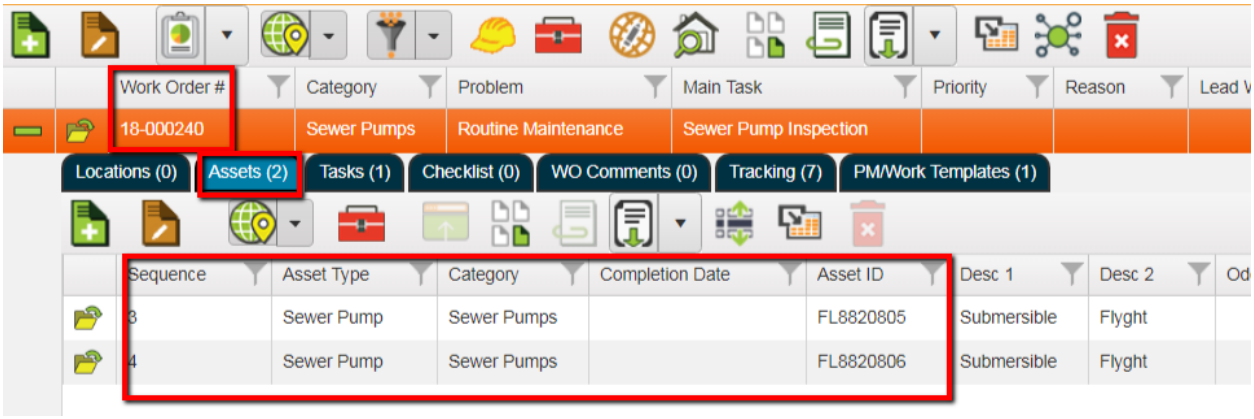
View the generated work orders.

- On the PM Grid, Select the Associated WOs grid. You will see the new work order listed as their separate generation schedules are reached. To view the work orders select the relationship icon  . Then Select Work Orders ().



- On the new work orders, you will see the Category, Problem, and Main Task that you chose in the PM. Additionally, the checklist items, tasks, and resources will be included. As you can see below, this Work Order's Assets tab contains the two pumps from the second PM group that we created.



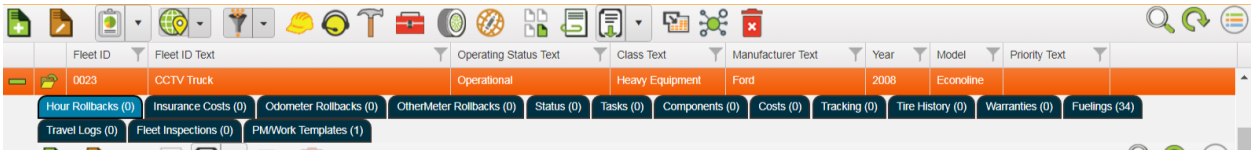
6. Close the work orders by entering an End Date and setting the Status to "999-Complete". This will enable the PMs to generate new work orders at the next scheduled intervals.

Tightly Linked PMs

The third type of advanced PM is the **Tightly Linked PM**. This feature allows you to have a series of two or more sliding PMs that are generated based on a single, scheduled PM. In other words, Tightly Linked PMs are not based on time (like a Scheduled PM), but instead are based on how often the initial PM (or linked PM) is generated.

To explain this feature, we'll go over a detailed example. We'll first set up the initial Scheduled PM, and then show you how the Tightly Linked PMs are set up and scheduled:

1. Open a vehicle record in the *Fleet Inventory* module.
   - Using the Web application open a tab within Modules *Fleet>>Fleet>>Fleet Inventory*.
   - In the example below, you can see that we've accessed a *Fleet Inventory* record for a CCTV Truck.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OtherMeter Rollbacks (0)
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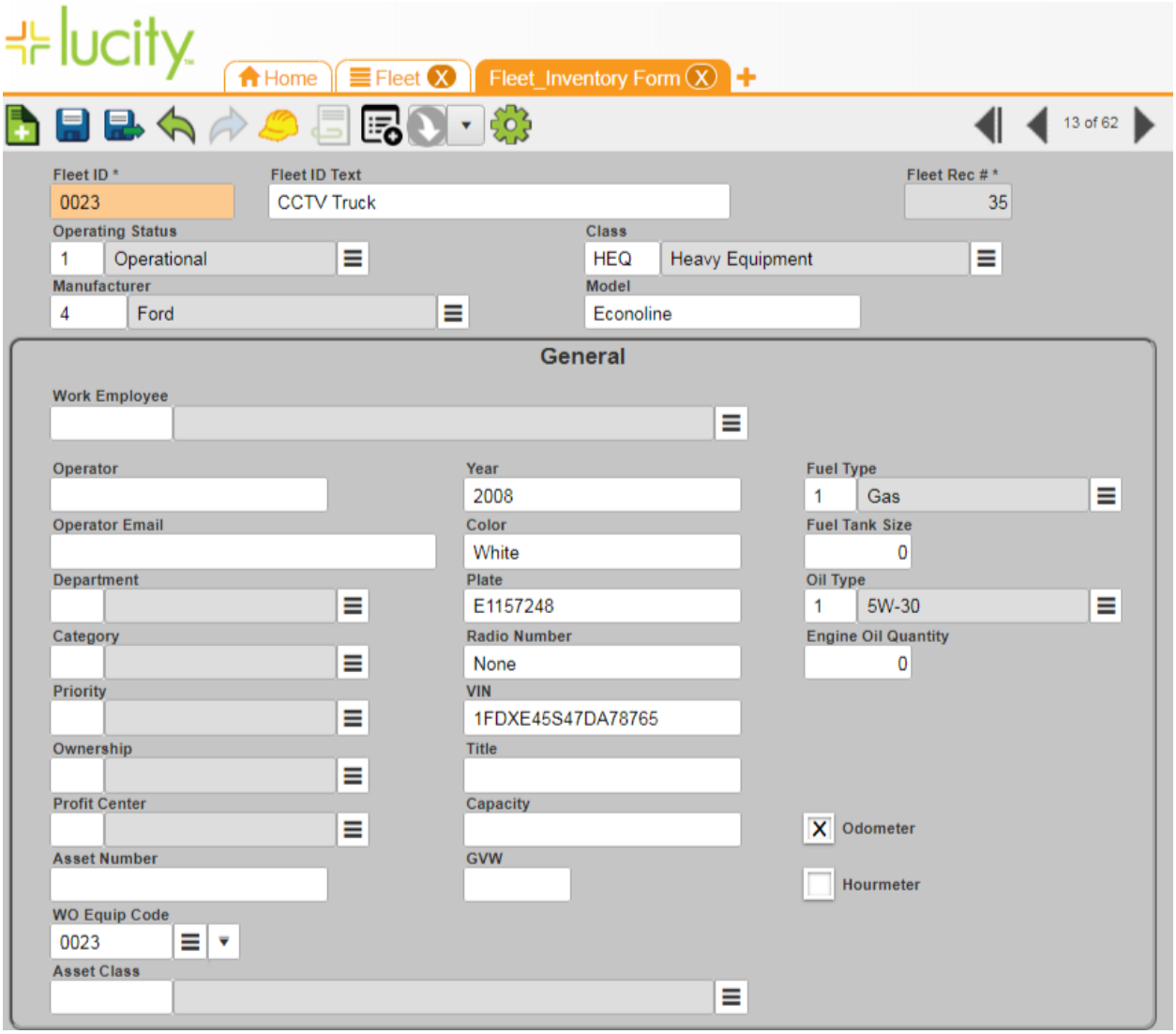
Tasks (0)
Components (0)
Costs (0)
Tracking (0)
Tire History (0)
Warranties (0)
Fuelings (34)
Travel Logs (0)
Fleet Inspections (0)
PM/Work Templates (1)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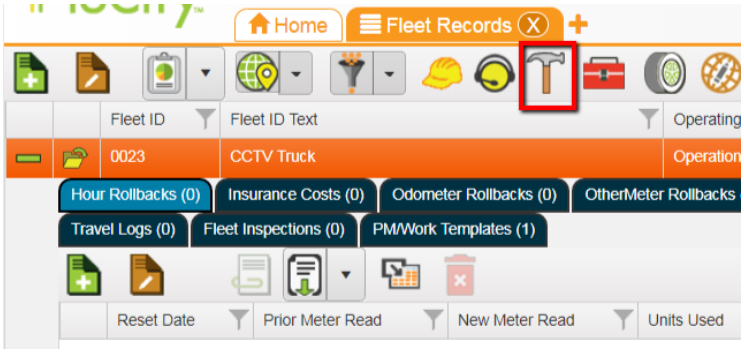
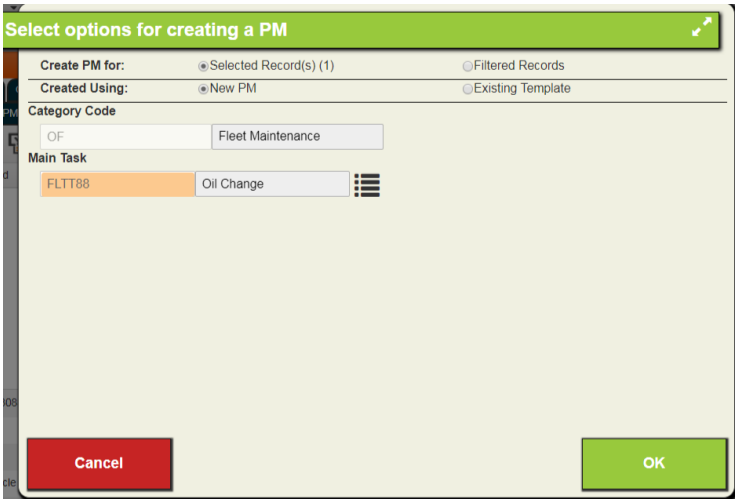
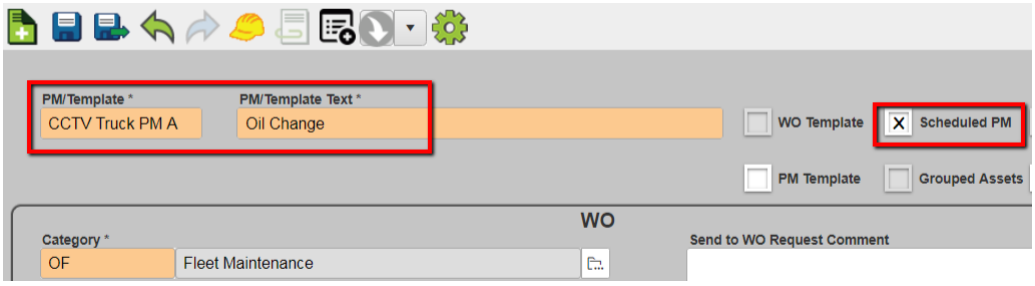
2. Create an initial, Scheduled PM for a 3-month oil change.

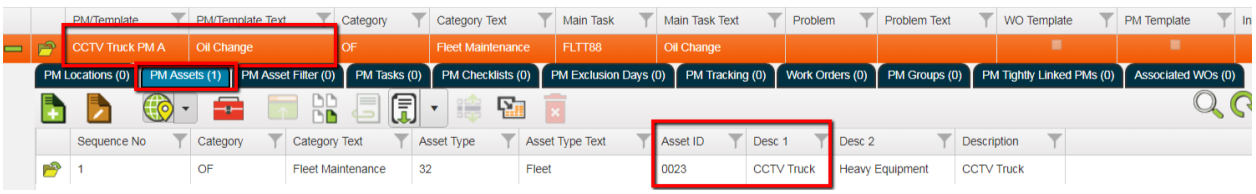
- Click the Create New PM/Template button  on the Fleet record's module toolbar. A PM/Template will be generated with the Truck asset and category included.





- Create a unique PM/Template code-description in the header. We've titled this example, "CCTV Truck PM A – Oil Change".
- Unselect the WO Template and Select the **Scheduled PM** checkbox. This distinguishes the PM from a Work Template and allows you to use the scheduling function.





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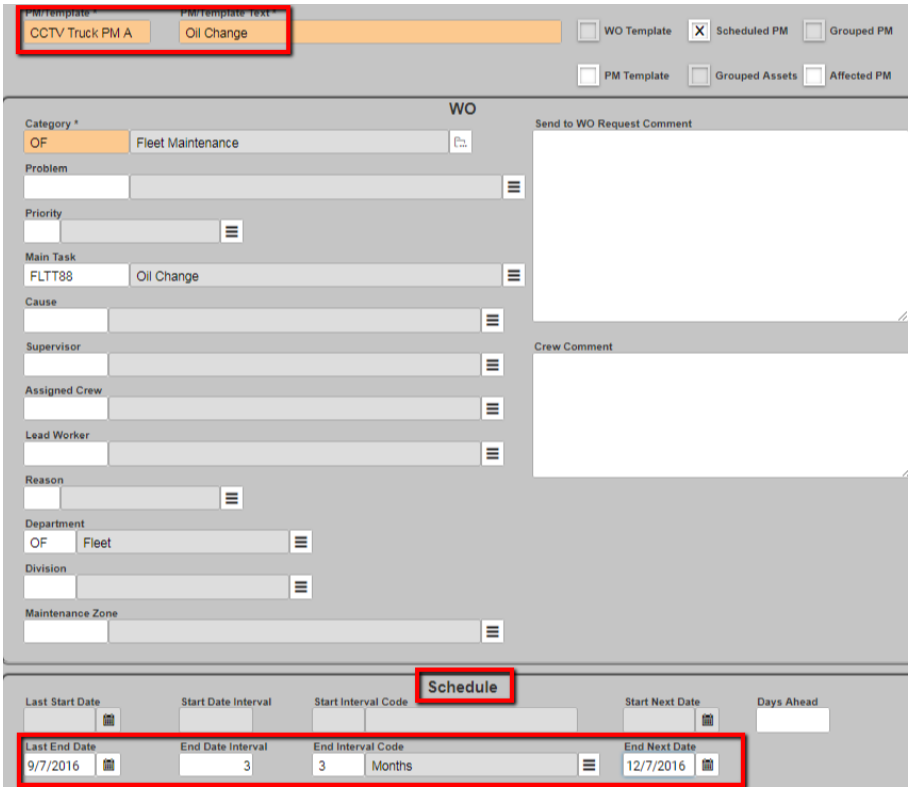
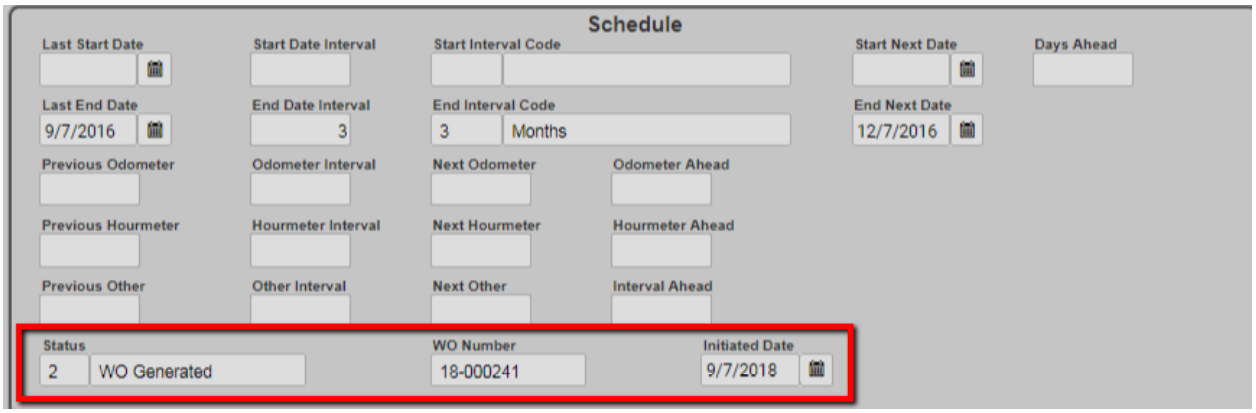
3. Determine whether you would like to use a **fixed** or **floating** schedule.
   - In this example, we'll demonstrate use of a **floating** schedule (based on the date the work order is closed). Remember, the Grouped PM and Grouped Asset PM examples earlier in this workbook both used fixed schedules.
   - Open the PM/Template Form and find the Schedule Section, enter a work order end date in the Last End Date field. This field will automatically be updated each time a work order is completed.



   - Select the interval for the next PM to be generated.
     - In this example, we've set a 3 month interval.
   - Click in the Next End Date field and the date will automatically be populated based on the end date and the selected interval.

- Because we set this PM up with a date in the past, the work order will be automatically generated and the status will read “2 – WO Generated” and the WO Number and Initiated Date fields will be populated after selecting Save .



- After you have set up your PM schedule, close and save the record.

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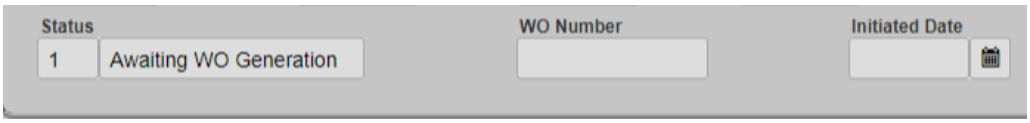
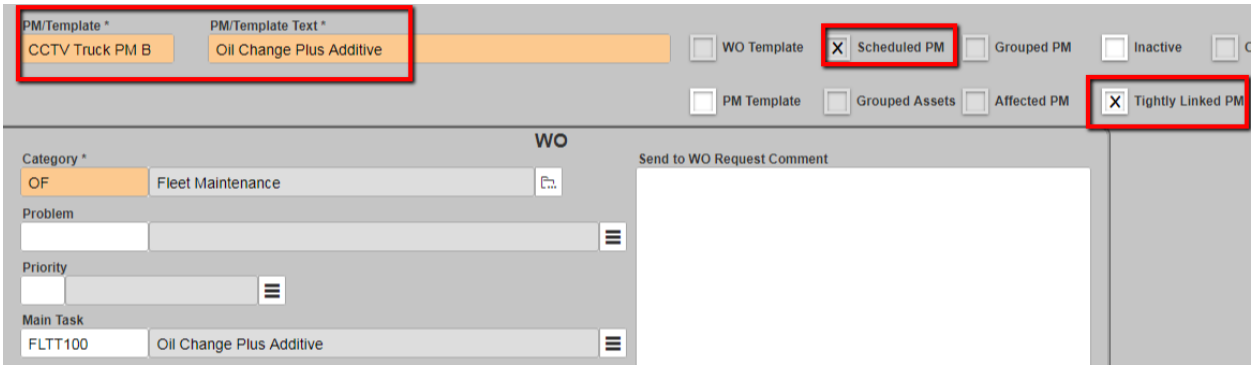
- Each time a PM work order is closed, the PM schedule resets itself. When a PM is reset, if the date is in the future, the status will read “1 – Awaiting WO Generation” and the WO Number and Initiated Date fields will be blank. These settings will remain until the next work order is generated.



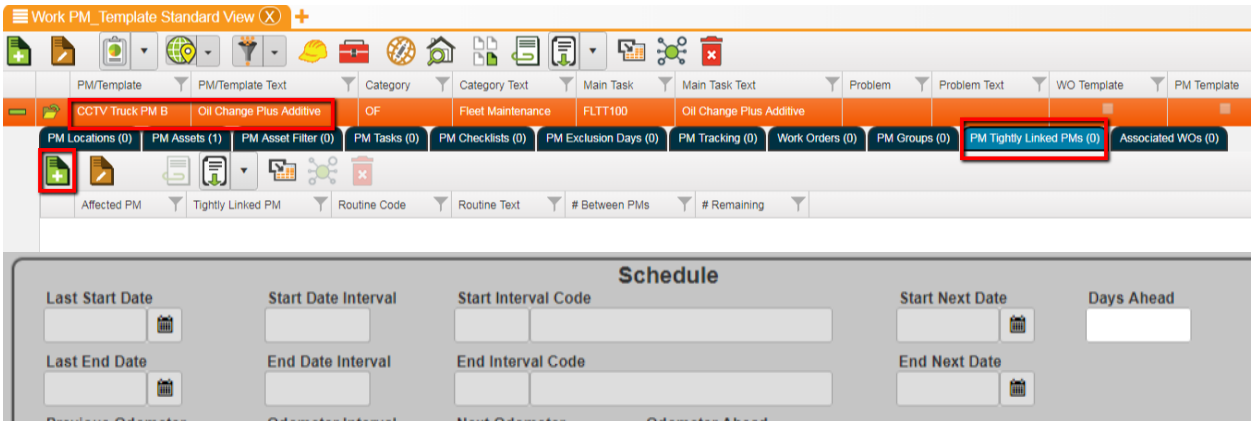
4. Create a second PM to be tightly linked with the first. This PM will be generated every six months and will include an oil change plus additive.

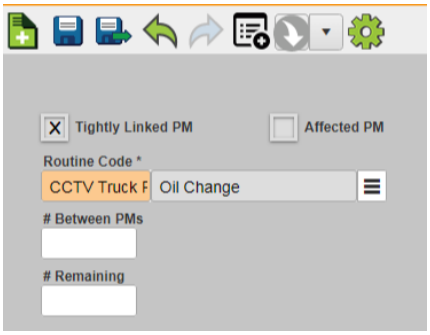
- Click the Create New PM/Template button on the Fleet record’s module toolbar. A PM/Template will be generated with the Truck asset and category included.
- Create a unique PM/Template code-description in the header. We’ve titled this one, “CCTV Truck PM B – Oil Change Plus Additive”.

- Unselect the WO Template checkbox and Select the **Scheduled PM** checkbox. This distinguishes the PM from a Work Template.
- Select the **Tightly Linked PM** checkbox. This allows you to have a sliding PM schedule. The scheduling grid will be disabled.



- Select the **PM Tightly Linked PMs** grid and select the *Add Record icon*  .

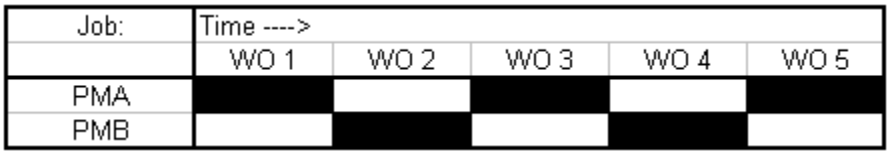




- Select a Routine Code from the Other Affected PMs pick list (**F9**). Only PMs with a matching Category and Asset will appear. To tightly link your PMs, select the scheduled PM you just created.

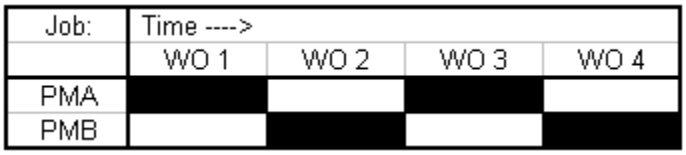
5. We'll use the **# Between PMs** and **# Remaining** fields to schedule the Tightly Linked PM. But first, in order to explain how these two fields are used, we'll go over a few examples by looking at when Work Orders are due. In the grids below, PMA represents the initial Scheduled PM and PMB represents the Tightly Linked PM.

- In the simplest scenario, PMB will alternate with PMA. In the example below, PMB is due every second time PMA generates a Work Order.

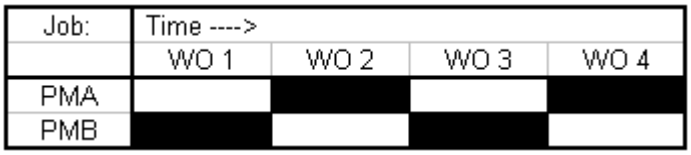


  - So, the number of PMAs between each generation of PMB is 1.
  - **# Between = 1**

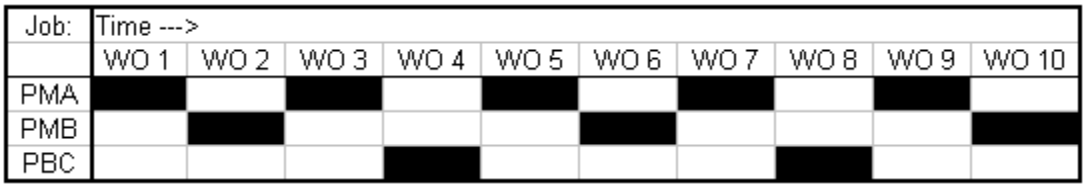
- In the example above, PMA is generated first and PMB second. Alternatively, PMB could have been scheduled to generate first. This is controlled by the # Remaining.
  - If PMB generates after one PMA, there is 1 PMA remaining.
  - **# Remaining = 1**



  - If PMB is due to generate first, there are no PMAs remaining before PMB is due.
  - **# Remaining = 0**



- Using these settings, any number of sophisticated PM programs can be made. In this next example, the initial Scheduled PM alternates with two jobs that alternate themselves. Remember, PMA is the initial Scheduled PM.

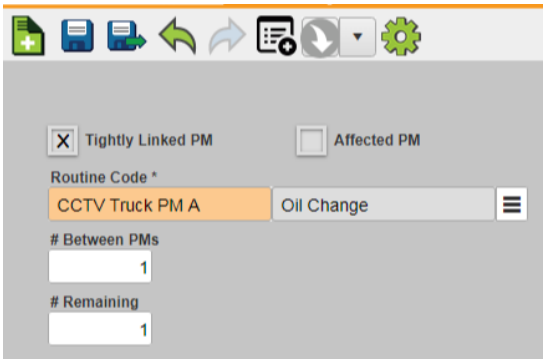


  - PMB: **# Between = 3, # Remaining = 1**
  - PMC: **# Between = 3, # Remaining = 3**

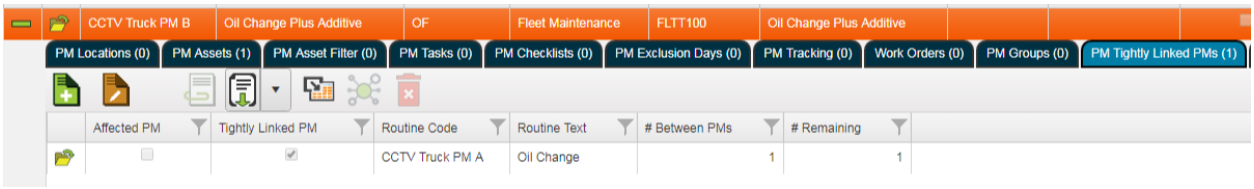
You can start this compound scheduling program at any point in the cycle by setting the **# Remaining = 0 and 2, 1 and 3, 2 and 3,** or **3 and 1**. The **# Between** always remains **3**.

6. Now that you understand how tightly linked PM scheduling works, you can set up the **# Between** and **# Remaining.**
   - Enter the # Between PMs that this PM will be generated. Since this Tightly Linked PM should generate every six months and the initial Scheduled PM is generated every three months, the **# Between = 1**.

- Indicate the # of PMs Remaining before this PM is generated. Since we want PM B to generate at the six-month mark (with the second, three-month oil change), set the **# Remaining = 1**.
- *Note: The # Remaining field will automatically change each time the Work Order that generated PM A is closed. In the example below, after PM A is reset, the # Remaining will reset to 0, signifying that PM B will be generated.*



7. Using this grid, PM B has been tightly linked to our previous oil change PM A.
   - PM A will be generated on a floating schedule every three months.
   - PM B will be tightly linked to PM A. Based on the numbers we set up, it will be generated after one PM A has been completed. Thus, every six months, a work order will be created for this truck requiring an oil change plus additive.



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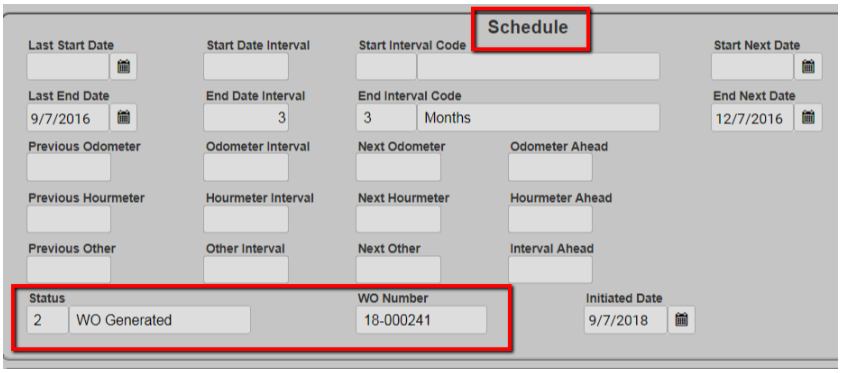
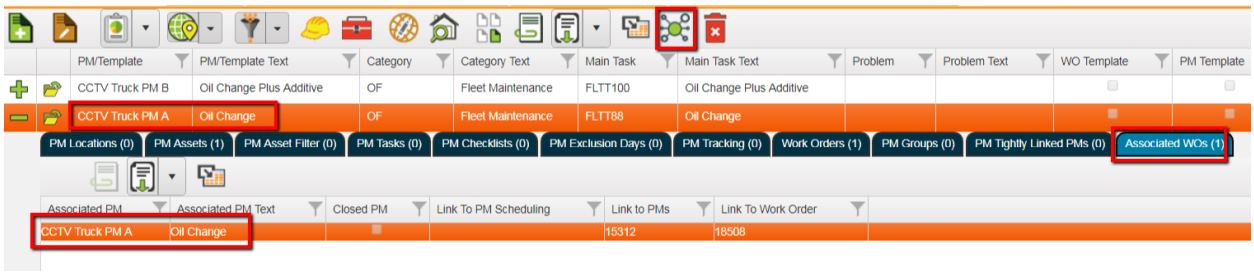
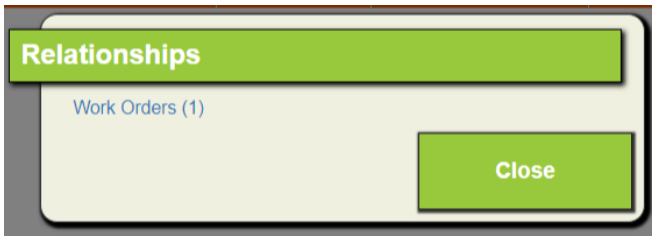
8. As the work orders are generated, you can access them in two ways:

- On the PM A PM Template Form within the Schedule fields, you will see that the Status is "2-WO Generated". Beside the status, you will see the generated WO Number and initiated date.



- On the PM A Grid, Select the Associated WOs grid. You will see the new work order listed as their separate generation schedules are reached. To view the work orders select the relationship icon  . Then Select Work Orders ().





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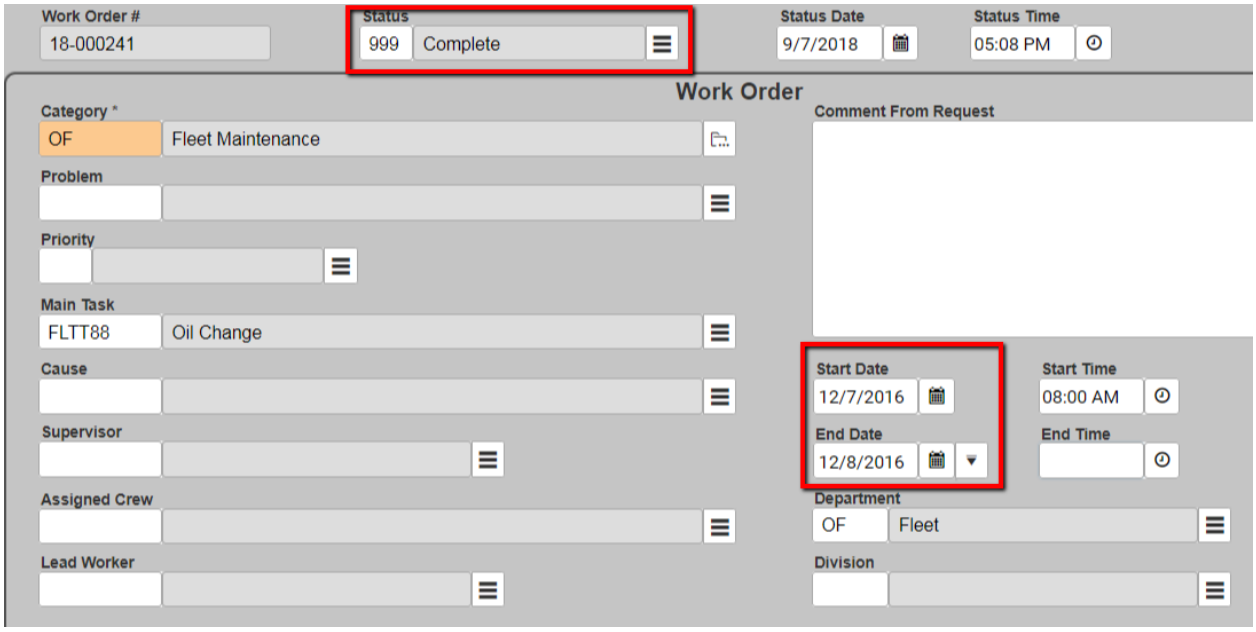
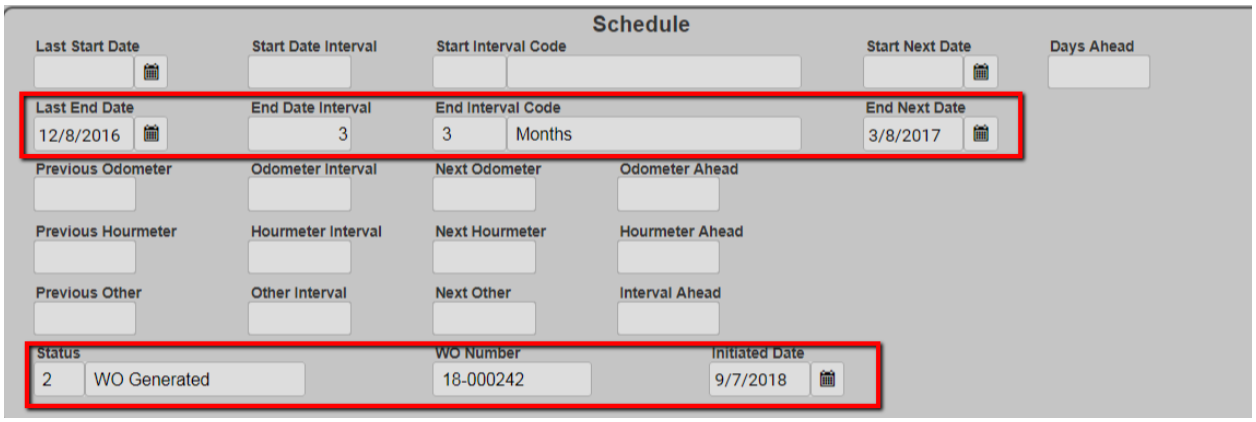
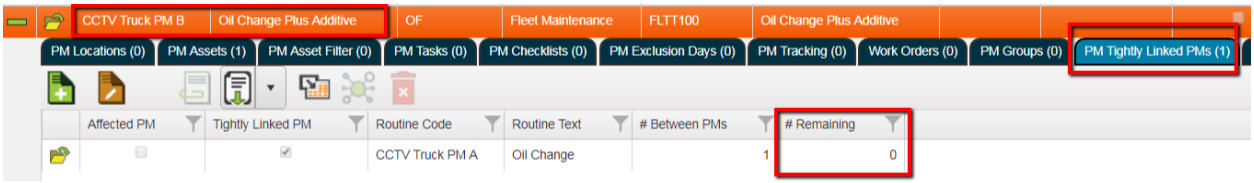
9. In order for PM B to be generated, you must close out (complete) the initial work order generated from PM A.
   - Enter the End Date in the field provided.
   - Set the status in the header to “999 – Complete”.



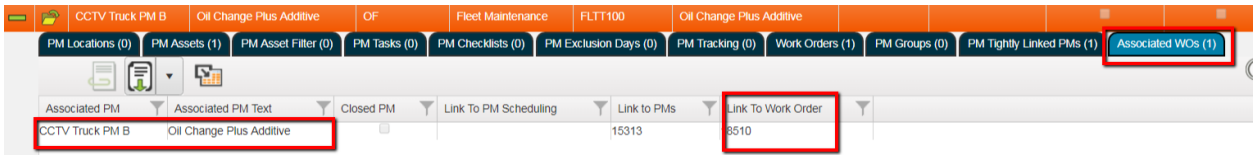
10. Review PM A. As you can see, the next work order has been generated and the dates in the schedule have also changed.



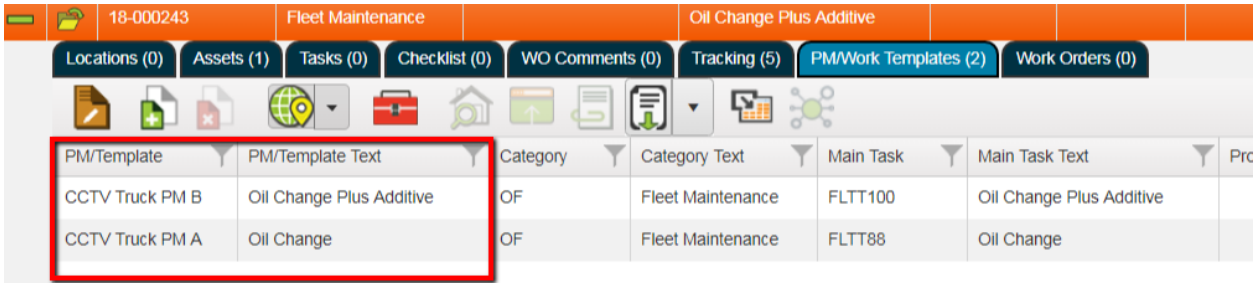
11. Review PM B.
   - The # Remaining field has been reset to 0.



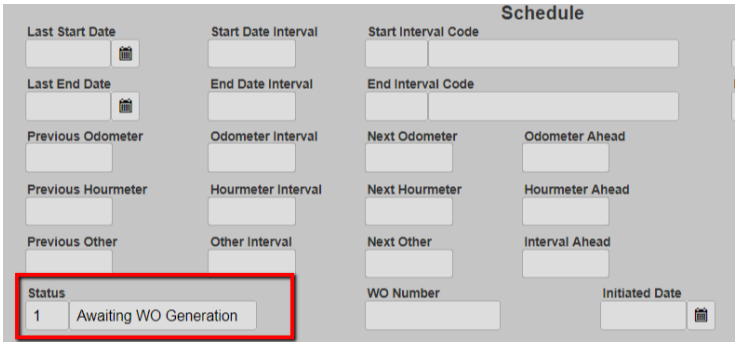
- Since the first oil change PM A has been completed and a second has been generated, the tightly linked PM B (oil change plus additive) has now also been generated and is included in the new work order.
- You'll see that the work order appears on PM B's Assocatied WOs Grid

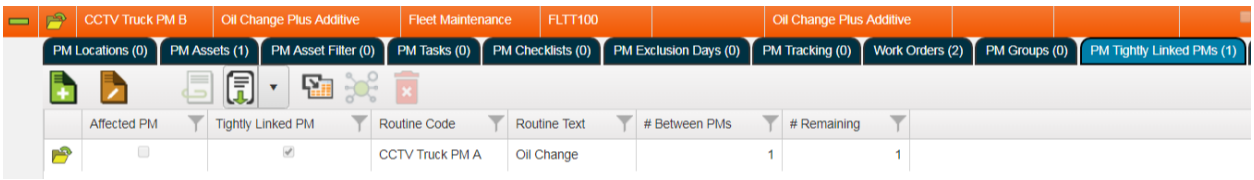


14. Open the new work order by double clicking on the listing in the Related WOs tab of either PM.
    - The new work order contains both PM tasks (PM A and PM B). These are displayed on the PM/Work Templates Grid.



15. Close the work order as before.
    - Both PMs will now be reset to "1-Awaiting WO Generation". PM B will be reset to have 1 PM A remaining before it will be generated again.





Tightly Linked Group PMs

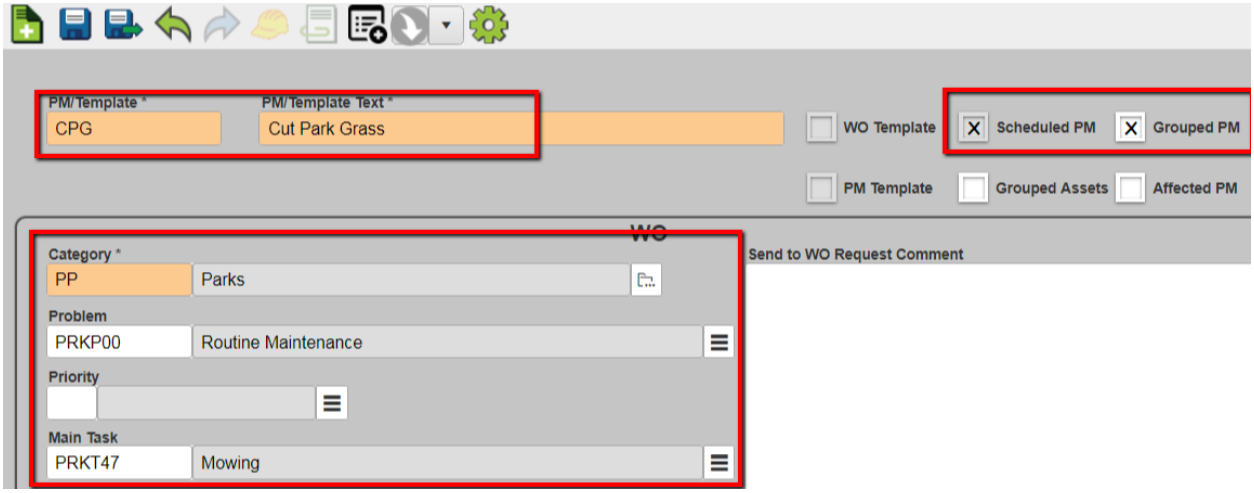
The final type of advanced PM is the **Tightly Linked Group PM**. This feature combines the Tightly Linked PMs and Grouped PMs discussed previously. It allows you to link PMs to a grouped PM system.

> *Reminder: Tightly Linked PMs are not based on time or schedules, but instead are based on how often the initial PM is generated. Grouped PMs allow you to create one PM record for multiple assets.*

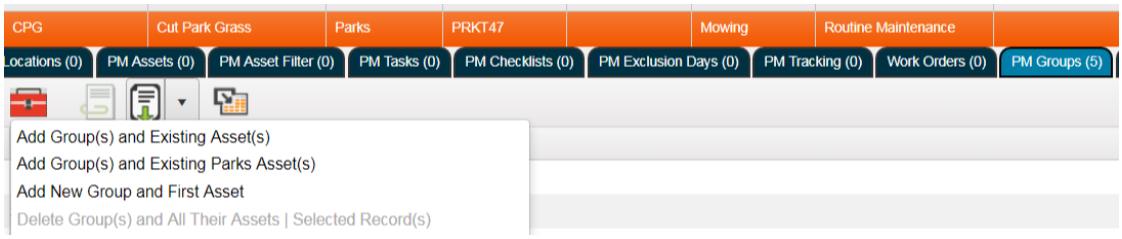
Let's assume you have a preventative maintenance task where you cut the grass in your city's parks every week, and cut and trim the park grass every two weeks. You'd like to set up only two PM/Templates (one for each task). These templates will include all of the parks in your city, as well as the crews, resources, and checklist items needed to complete the PM tasks. You'd like to easily schedule these tasks and create work orders based on the same template. The Tightly Linked Group PM feature allows you to accomplish this goal.

To explain this feature, we'll go over a detailed example:

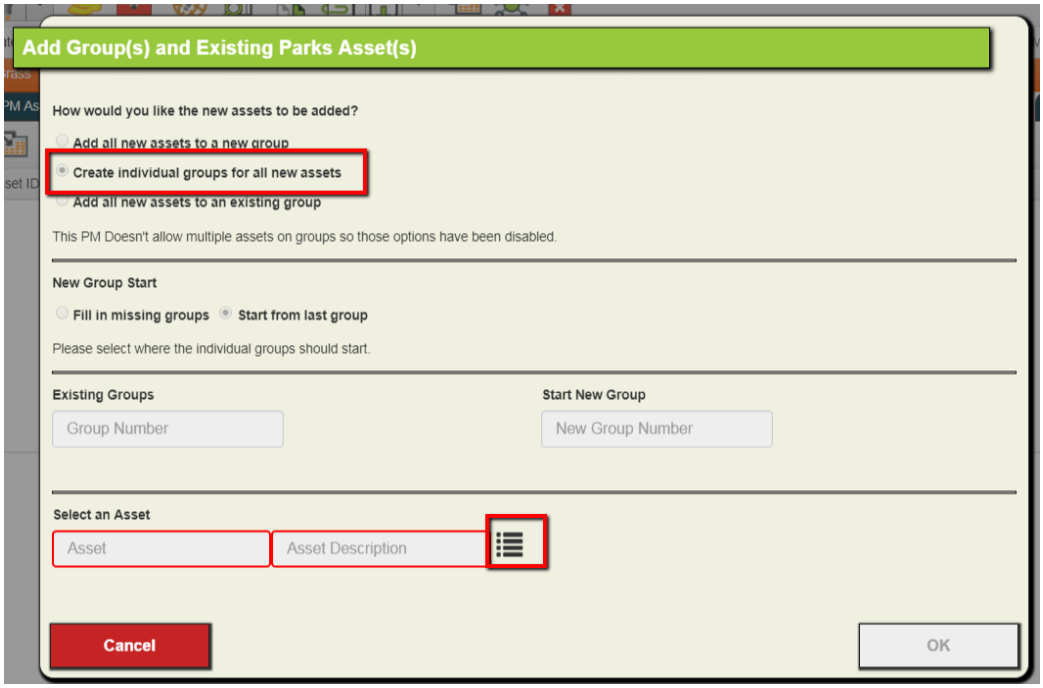
1. Create a new, Grouped PM record (this follows the same steps described earlier in this workbook).
   - Enter a unique PM code-description in the header. We've titled this example, "Cut Park Grass".
   - Select a related Category, Main Task, and Problem.
     - As you can see in the example below, we've chosen "Parks", "Mowing", and "Routine Maintenance" as the Category, Main Task, and Problem, respectively.
   - Select the **Scheduled PM** checkbox. This distinguishes this PM record from a Work Template.
   - Select the **Grouped PM** checkbox. This allows you to create one PM for multiple assets. It also gives you access to the **Grouped PMs** tab.



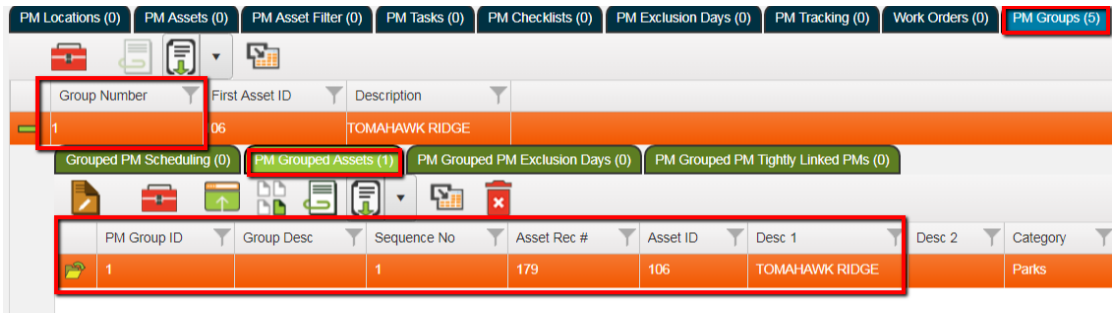
2. Add checklist items, tasks, and resources needed to cut the park grass.
3. Add your Park assets to the PM.
   - You will use the PM **Groups Grid** to include assets. You will not use the PM Assets Grid for this type of PM.
     - In our example, we will use the Toolkit option on the PM Groups grid and select *Add Group(s) and Existing Parks Asset(s)*.

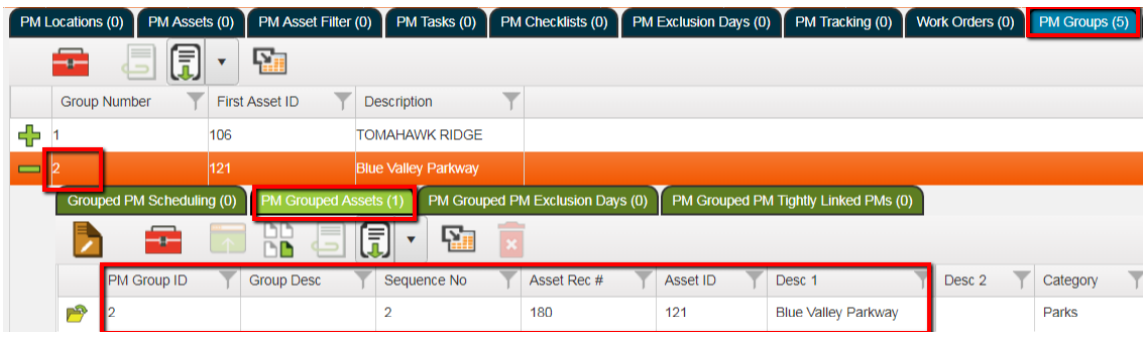


- After selecting the Toolkit option a popup dialog will display.



- The assets selected will be added to the PM Grouped Assets Grid. Each asset will be given its own unique PM Group ID.

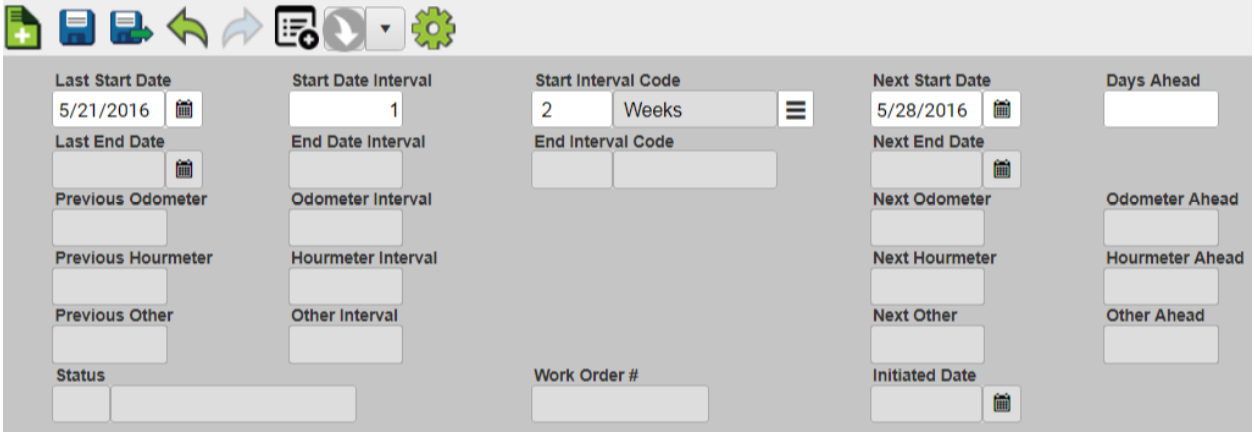




Schedule your PMs.

- You will use the **Grouped PM Scheduling** Grid to schedule your Grouped PM. You will not use the Schedule fields on the PM/Work Template Form for this type of PM.
- Select the Toolkit option on the Grouped PM Scheduling Grid and select *Add New Schedule*.
- Determine whether you would like to use a **fixed** or **floating** schedule.
    - In the example below, we have set up a fixed schedule based on the last start date of the work order.
    - We have set a 1-week interval for work order generation.

- Repeat this scheduling process for each park asset in your Grouped Assets grid.



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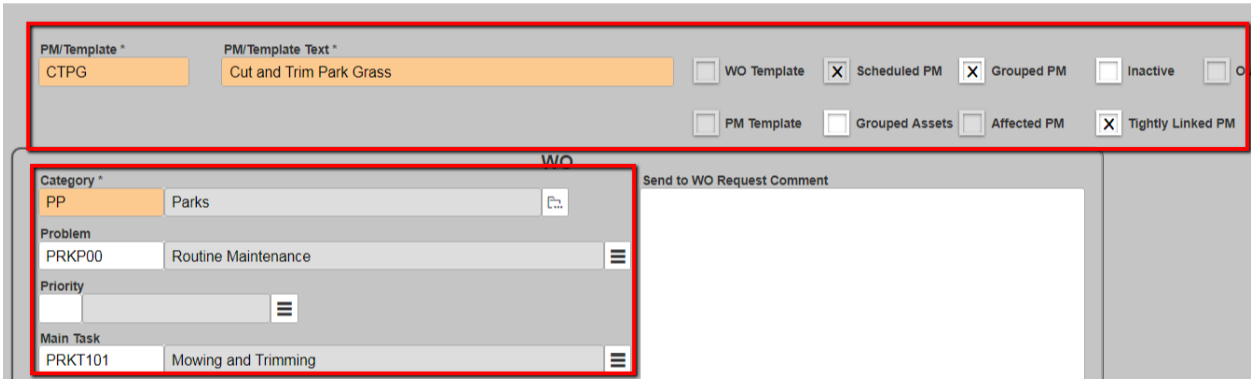
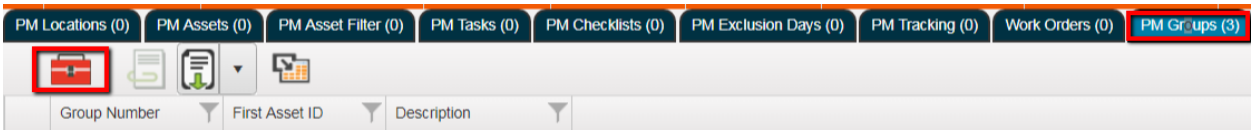
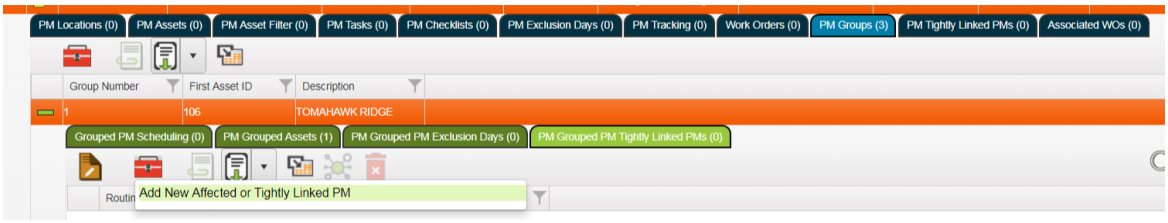
4. Create a new PM record, tightly linked to your grouped PM.
    - Enter a unique PM/Template code-description in the header. We've titled this example, "Cut and Trim Park Grass".
    - Select the **Scheduled PM** checkbox. This distinguishes the PM record from a Work Template.
    - Select the **Grouped PM** checkbox. This allows you to create one PM for multiple assets. It also gives you access to the **Grouped PMs** tab.
    - Select the **Tightly Linked PM** checkbox. This allows you to create a sliding PM schedule. The scheduling grid will be disabled.



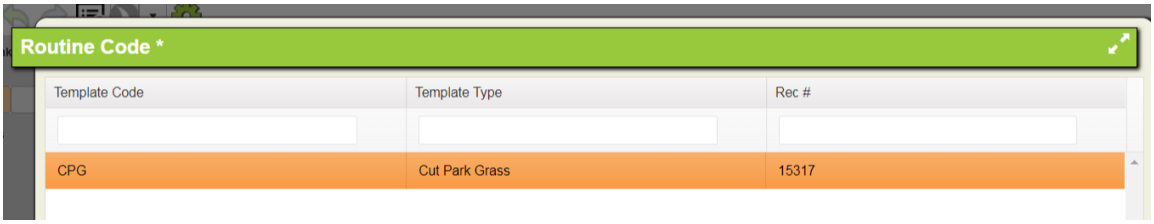
5. Add your Park assets to the PM.
    - You will use the PM **Groups Grid** to include assets. You will not use the PM Assets Grid for this type of PM.
        - We will use the Toolkit option on the PM Groups grid and select *Add Group(s) and Existing Parks Asset(s)*. You will use the PM **Groups Grid** to include assets. You will not use the Assets tab for this type of PM.



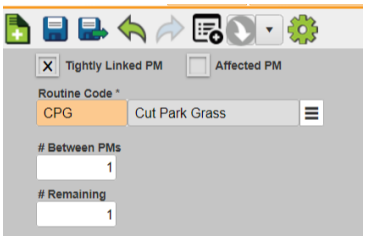
    - Load the same Park Assets you used in the previous, scheduled PM.
        - The assets will be added to the PM Grouped Assets grid. Each asset will be given its own unique PM Group ID.
6. Schedule your PMs.
    - Select the **PM Grouped PM Tightly Linked PMs** Grid and select *the Toolkit Option Add New Affected or Tightly Linked PM*.



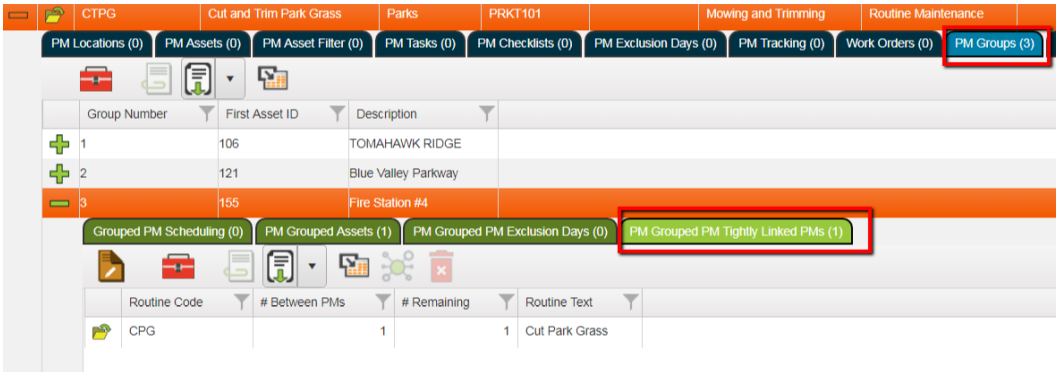
- Select a Routine Code from the Other Affected PMs pick list (**F9**). You should select the Scheduled, Grouped PM (Cut Park Grass) that you just created.



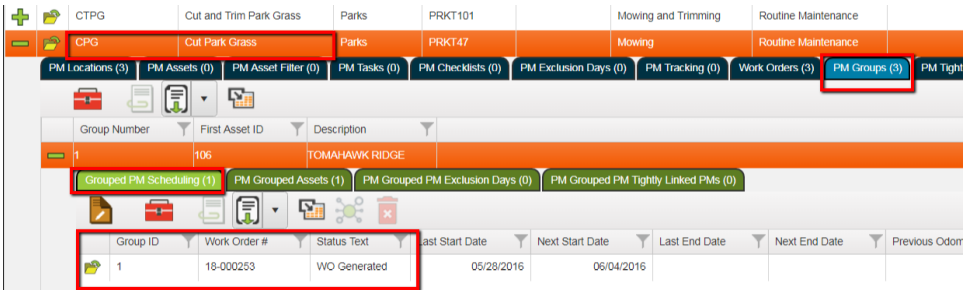
- Enter the Number Between PMs that this PM will be generated. Since we want this PM to generate every two weeks and the tightly linked PM is generated every week, we'll set the **# Between PMs = 1**.
- Set the **# Remaining = 1**, telling the system that this PM will be initiated the second time the Cut Park Grass PM is generated.



- Save and close the record.
- Now, this PM will be tightly linked to our previous PM.
    - The Cut Park Grass PM will be generated on a fixed schedule every week.
- The Cut and Trim Park Grass PM will be tightly linked to the initial PM and will be generated every two weeks.
- Repeat this process for the other Park assets in the PM Grouped PM Tightly Linked PMs Grid.



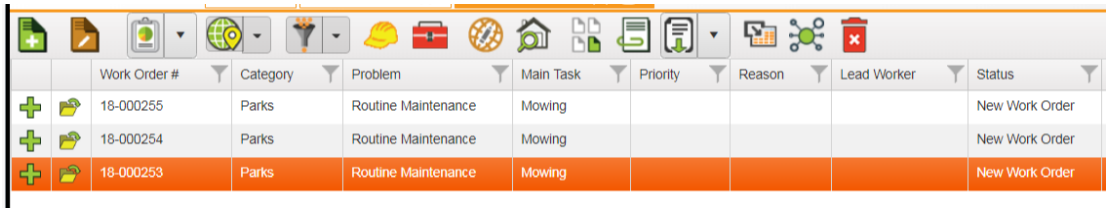
7. Review the Cut Park Grass PM.
    - On the Grouped PM Scheduling Grid of PM/Template CPG, you will see the new work order.

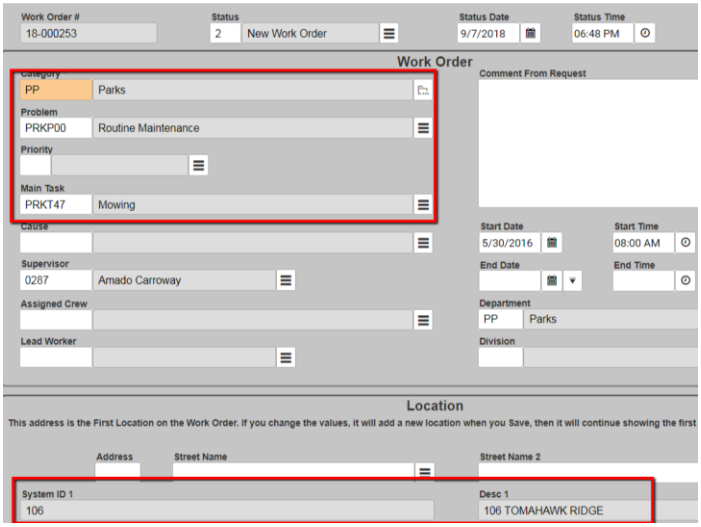


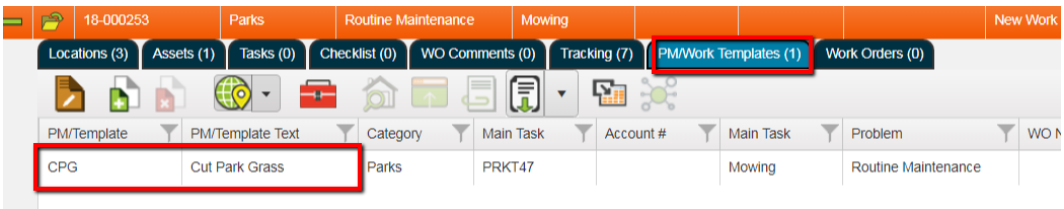
- On the CPG Grid, Select the Associated WOs grid. You will see the new work order listed as their separate generation schedules are reached. To view the work orders select the relationship icon  . Then Select Work Orders ().

9. View the generated work order.

- On the new work order, you will see the Category, Problem, Main Task, and Asset that you chose earlier. You'll also see the Cut Park Grass PM listed on the Related tab.







10. Close the work order. Enter an end date and status of "999-Complete".

- This allows a second Cut Park Grass PM to be generated.

- Due to the numbers we set up earlier, the Cut and Trim Park Grass PM will also be generated at this time.

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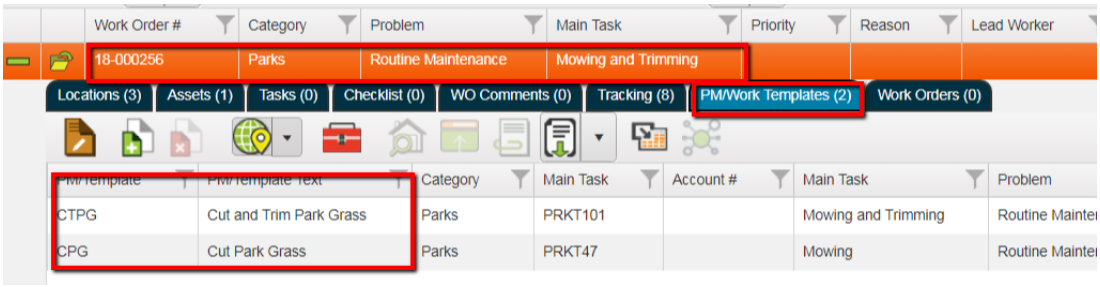
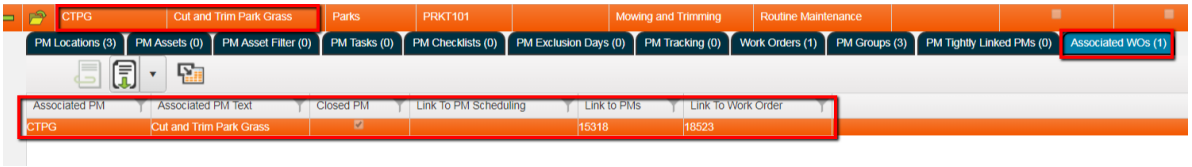
11. Review the first PM (Cut Park Grass).
    - The Associated WOs Grid will have two listings. The first will be the work order you just completed. It will have the mowing task only. The second will be a new work order. It will contain tasks for both mowing and trimming.



12. Review the second PM (Cut and Trim Park Grass).
    - The Related WOs tab will have only one listing. It will display the new work order with both tasks (mowing and trimming).



13. View the new work order.
    - On the CTPG Grid, Select the Associated WOs grid. You will see the new work order listed as their separate generation schedules are reached. To view the work orders select the relationship icon  . Then Select Work Orders ().
    - On the Work Order's Related tab, you will see both associated PMs.
14. Close the work order as before, allowing the system to generate additional PMs