Synergi Plant Training

Risk based inspection

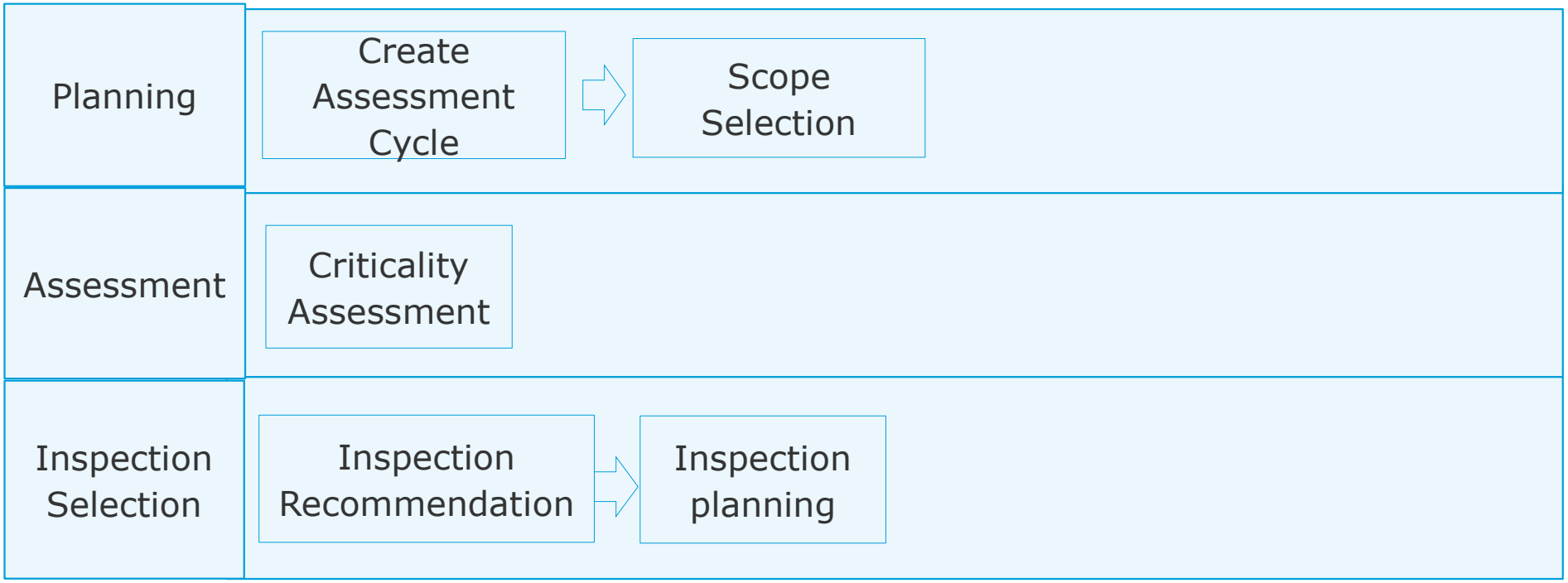
Risk Based Inspection

Risk based inspection (RBI) is a method in which assets are identified for inspection based on their associated risks as opposed to a predetermined fixed time interval. In other words, it is a prioritizing and planning tool, predominantly used in the oil and gas industries, which aids in the identification of high priority items (i.e., those with high risk) vs. low priority items (i.e., those with low risk). This approach allows the users/owners of the assets to maximize the effectiveness of their inspection resources by concentrating them on those assets that pose the highest risk and not wasting resources on assets that are, in essence, inconsequential.

In Synergi Plant, when user wants to create, revise, update risk calculation, will open an assessment to access all information about current risk and recalculate with the latest inspection information (inspection, wall thickness, changed parameters, etc.). It will be possible to recalculate a single asset (RBI element) as well as run a batch calculation on a larger scope (i.e. for Plant). Once an assessment has been completed, an inspection plan needs to be approved. Only authorized users will be able to approve inspection plan. Below can be found snapshots of the overview process.

Risk Based Inspection

- Risk Based Inspection(RBI) is an analytical tool to examine equipment's such as pressure vessel, piping, heat exchangers in industrial plants. RBI is decision making methodology for optimizing inspection plans.
- The following diagram shows the overview of RBI assessment process in Synergi Plant. It can be divided into 3 phases: planning, assessment, and task selection. Each phase consists of different activities.

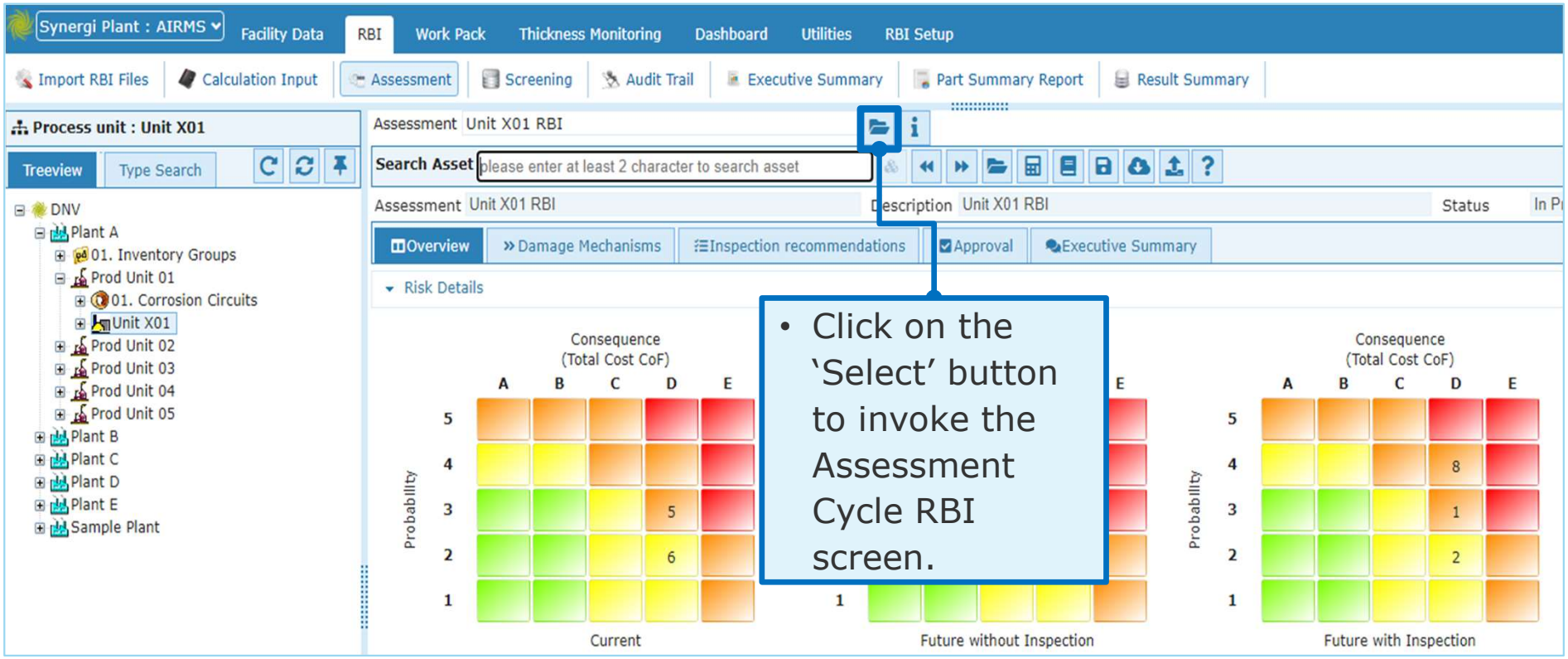


Risk Based Inspection

- RBI Assessment Navigation path:
- Standard->RBI->Assessment
- Steps involved in RBI Assessment
  - Create Assessment
  - Scope Selection
  - Assessment Method Selection
  - Asset Data
  - Damage Mechanism
  - Consequence Calculation
  - Final Consequences
  - Likelihood Calculation
  - Final Probability
  - Inspection Recommendations
  - Approval
  - Executive Summary

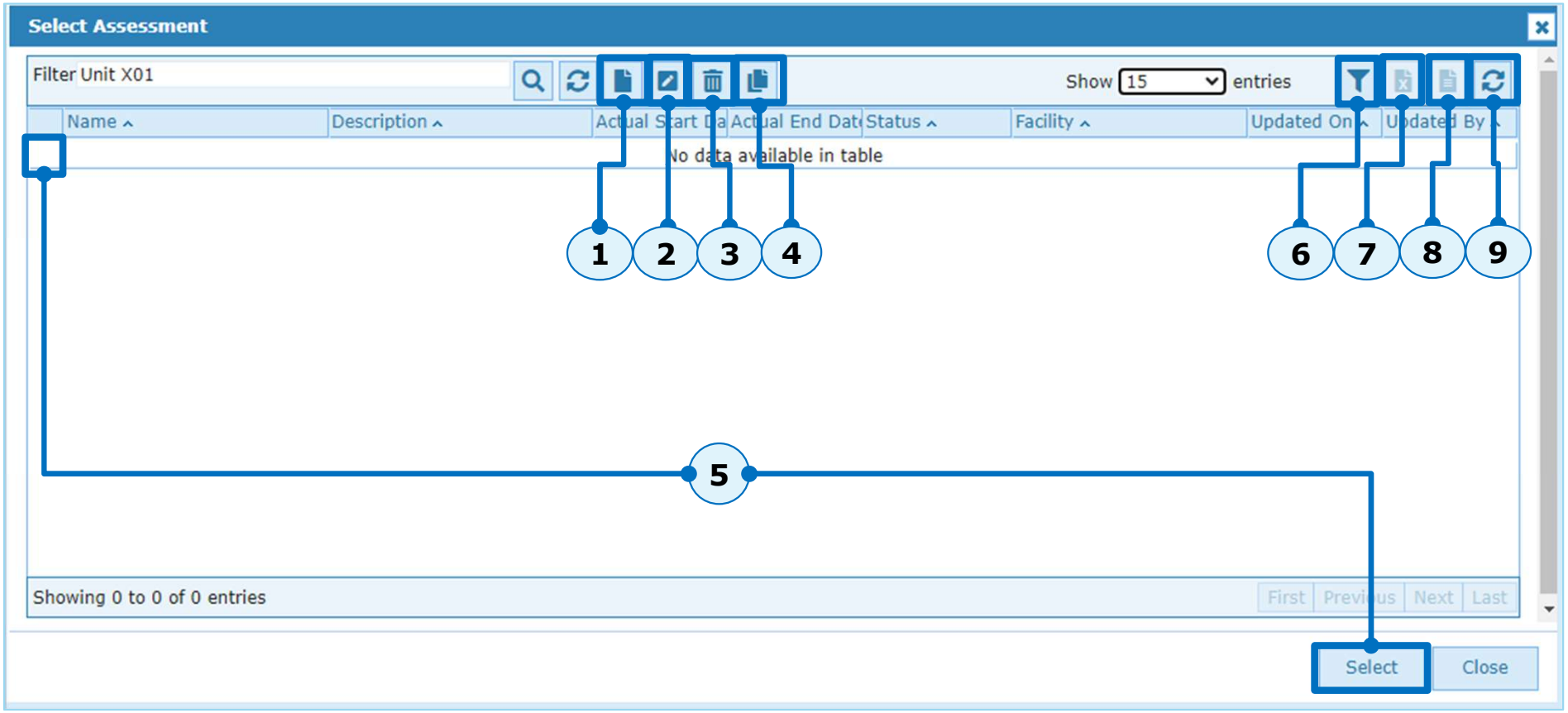
RBI – Creating Assessment

- Navigation: Focus on your Process Unit, and select RBI -> Assessment
- Creating assessment cycle is the first step in RBI process. In general one assessment will be created for all the parts/elements and user will recalculate based on the latest data.



RBI – Creating Assessment

- In Assessment RBI screen user will be able to create, modify, delete, and copy assessment.
- See description of each function in the next page.



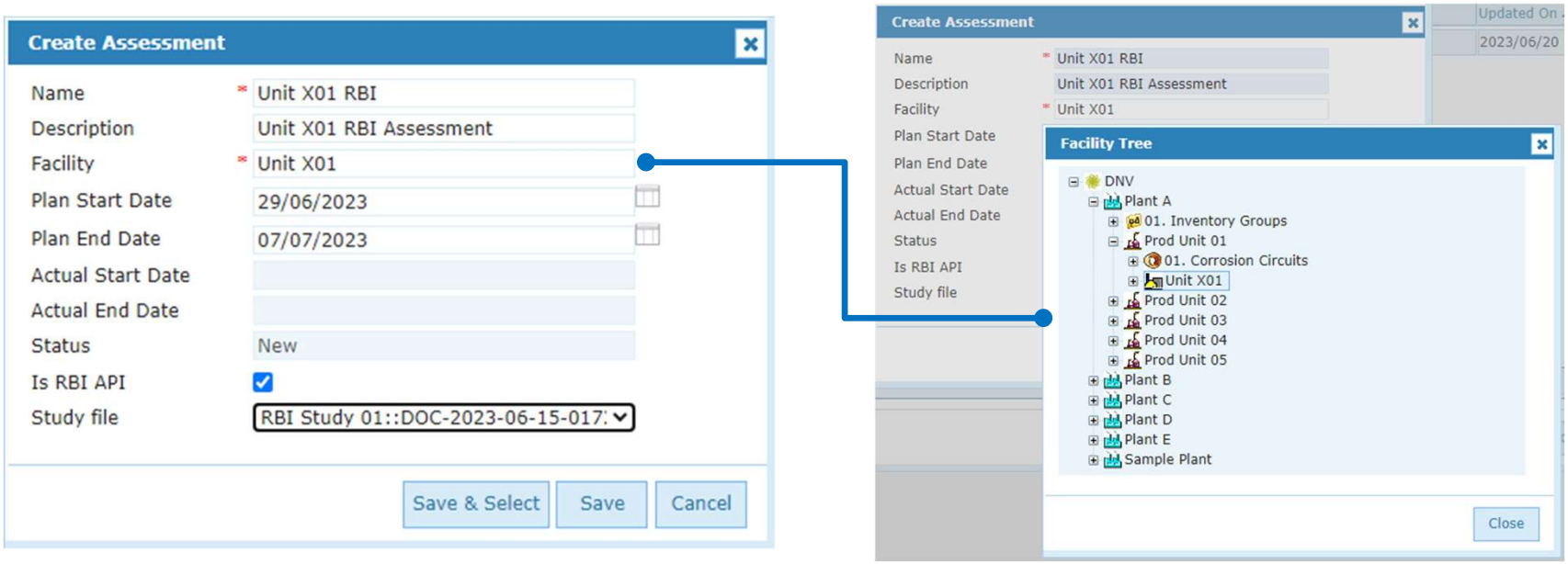
RBI – Creating Assessment

- In Assessment RBI screen user will be able to create, modify, delete, and copy assessment.

Step	Description
1	• Click on the 'New' button to create a new assessment cycle. The screen shown in next slide will be invoked.
2	• Click on the 'Edit' button to modify a existing assessment cycle.
3	• Click on the 'Delete' button to delete existing assessment cycle.
4	• Click on 'Copy' button to copy to create the copy of the assessment.
5	• Once assessment cycle is created, it will be shown in the list. Select the assessment cycle by ticking the checkbox and click on the 'Select button'.
6	• Filter is used to filter the data based on columns in the grid.
7	• Export button is used to export the data to excel.
8	• Export All to excel button is used to export the data to excel.
9	• Refresh is used to refresh the grid data.

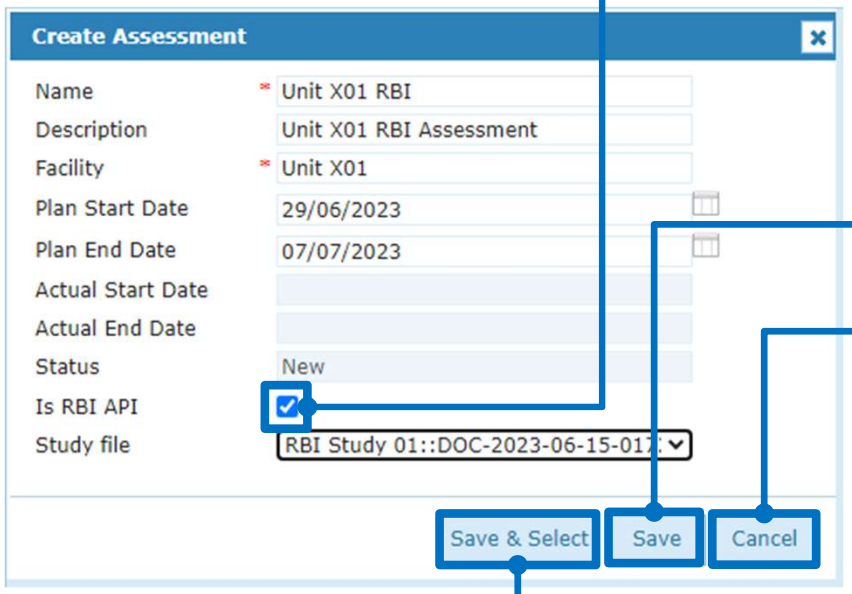
RBI – Creating Assessment

- This screen is invoked from ‘New’ button
- Name, Facility are mandatory.
- Facility column is used to limit the scope of asset for the assessment.
- Facility tree hierarchy appears as shown on select of the facility as shown below. This is to set the range of selectable elements into the assessment.



RBI – Creating Assessment

- Is RBI API check box is used when there is onshore study file to be used in Synergiplant with API 581 methodology.
- If RBI API is checked, then a study file should be selected. if RBI API is not checked the assessment will be used as bespoke assessment.
- Select the imported study file from the list. import of study file can be done using integration module.

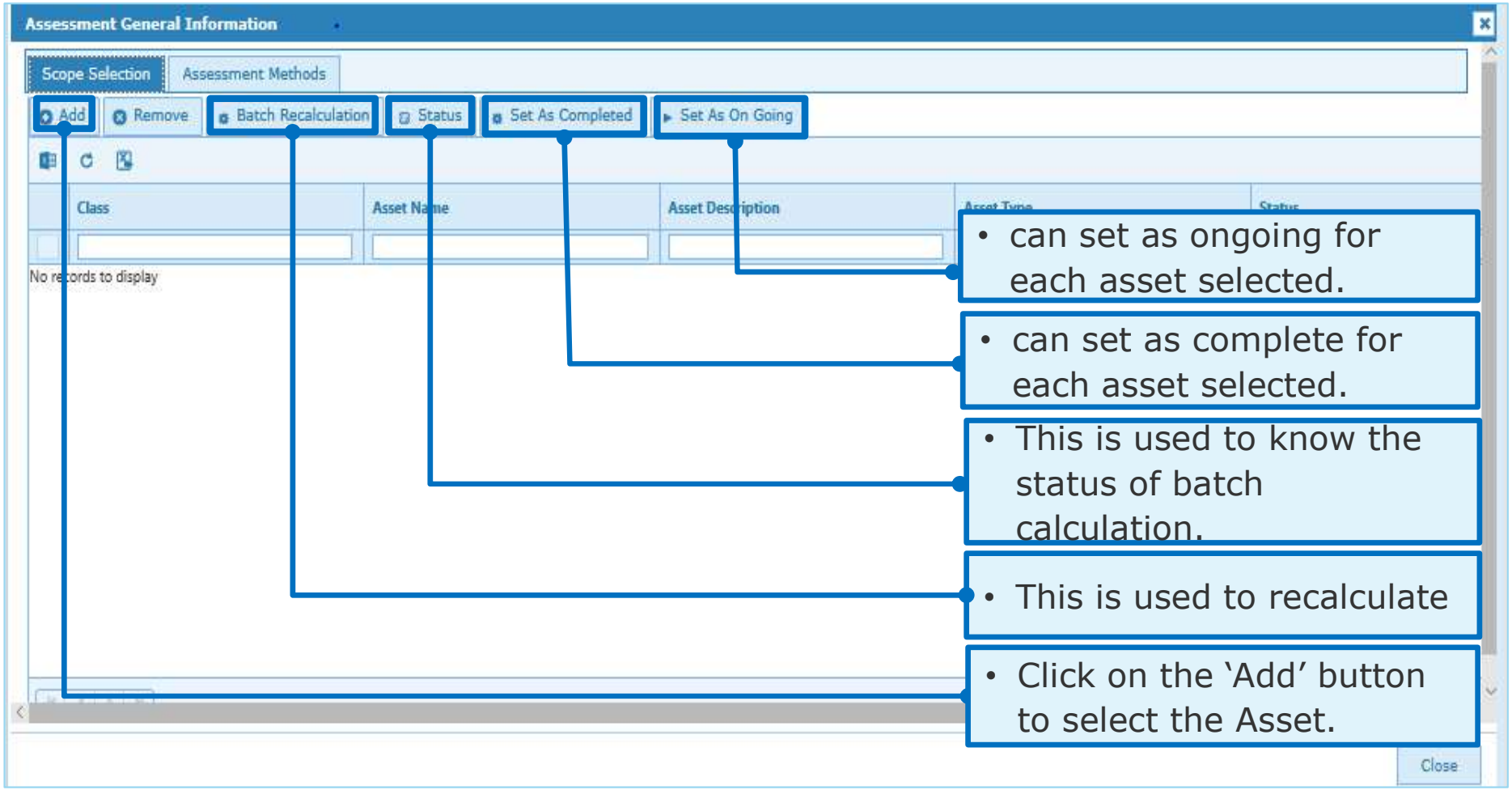


'Save' Button is used to save the Assessment.

- 'Cancel' button is used to close the screen without saving the changes
- Select Save & select to go to Scope selection. one can also go to scope selection from Assessment General Information Button as shown in Next Slide

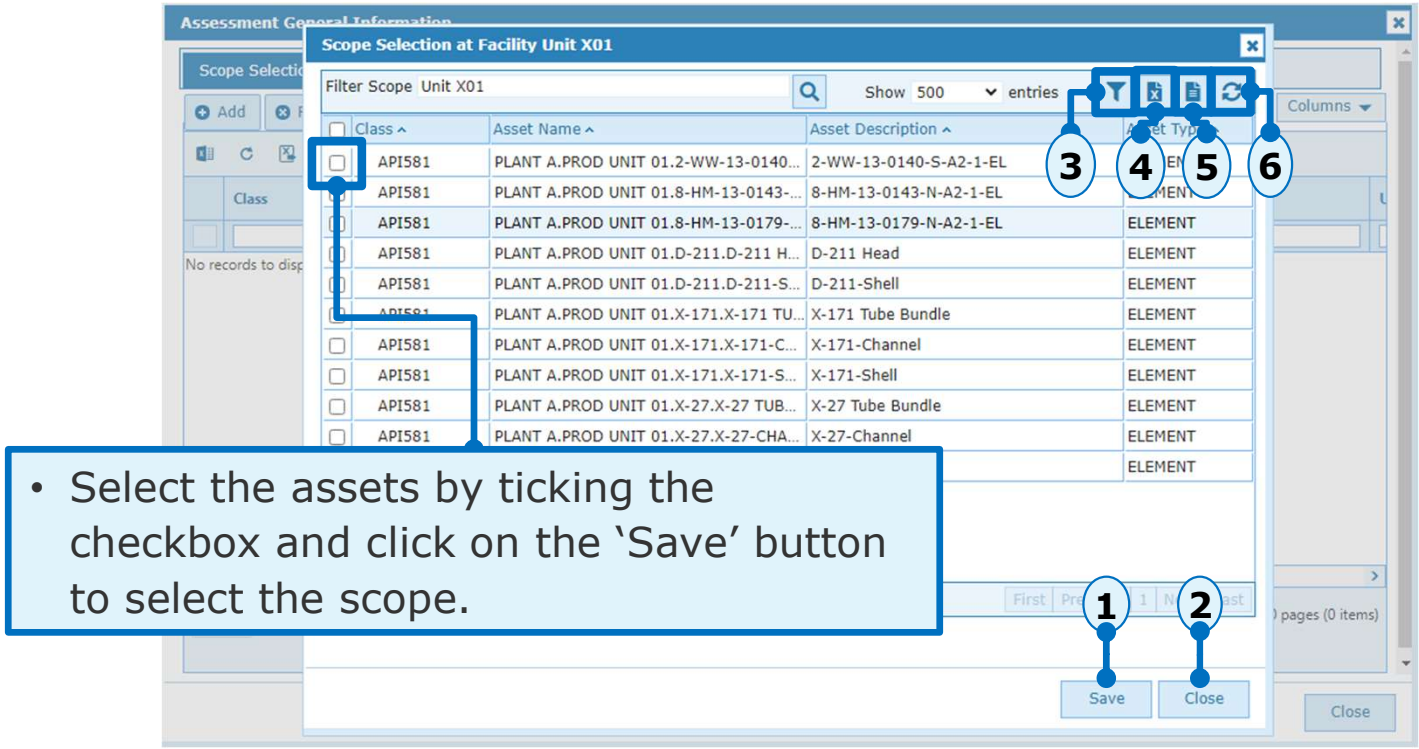
RBI – Scope Selection

- This step is to define the scope of assessment.
- Scope is defined by selecting the assets required for RBI assessment.



RBI – Scope Selection

- Click the Add button to add elements into the scope
- It displays a list of elements available for assessment. The list is filtered accordingly to the facility entered during the creation of assessment.
- Select all elements into the scope (for example).
- The batch recalculation status screen will show up with Get Input Data.



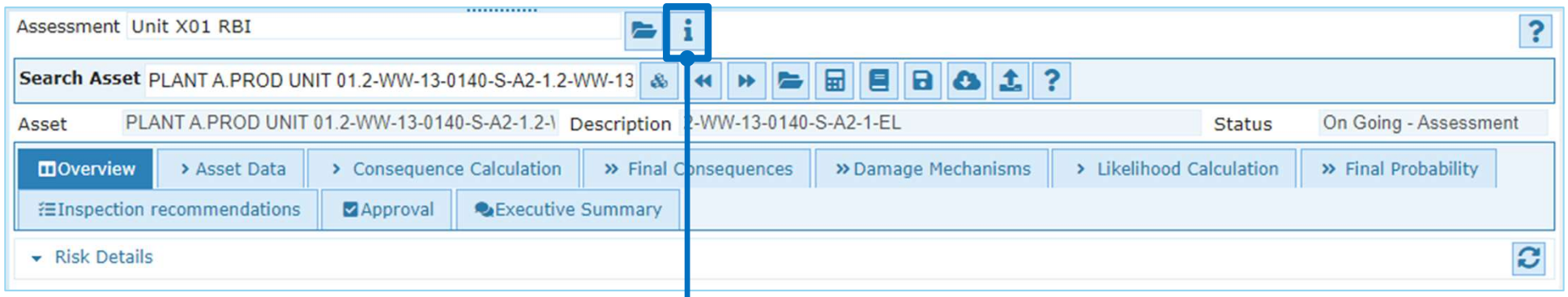
- Select the assets by ticking the checkbox and click on the 'Save' button to select the scope.

RBI – Scope Selection

Step	Description
1	Click on the 'Save' button to Select the scope for the assessment. The selected scope will be shown in the assessment main grid which was shown in previous slide. Once the save is done the next tab is Assessment Method selection as shown in next slide.
2	Close button is used to close the screen.
3	Filter is used to filter the data based on columns in the grid.
4	Export button is used to export the data to excel.
5	Export All to excel button is used to export the data to excel.
6	Refresh is used to refresh the grid data.

RBI – Scope Selection

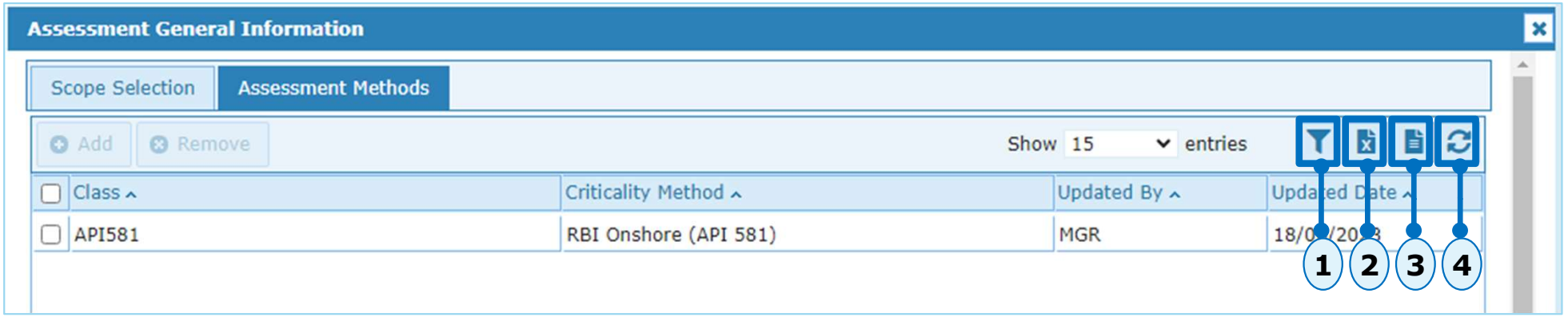
- Also, for the existing assessment to modify the scope navigate through Information button as shown below



- Click on the 'i' button to go to Scope selection screen

RBI – Assessment Method Selection

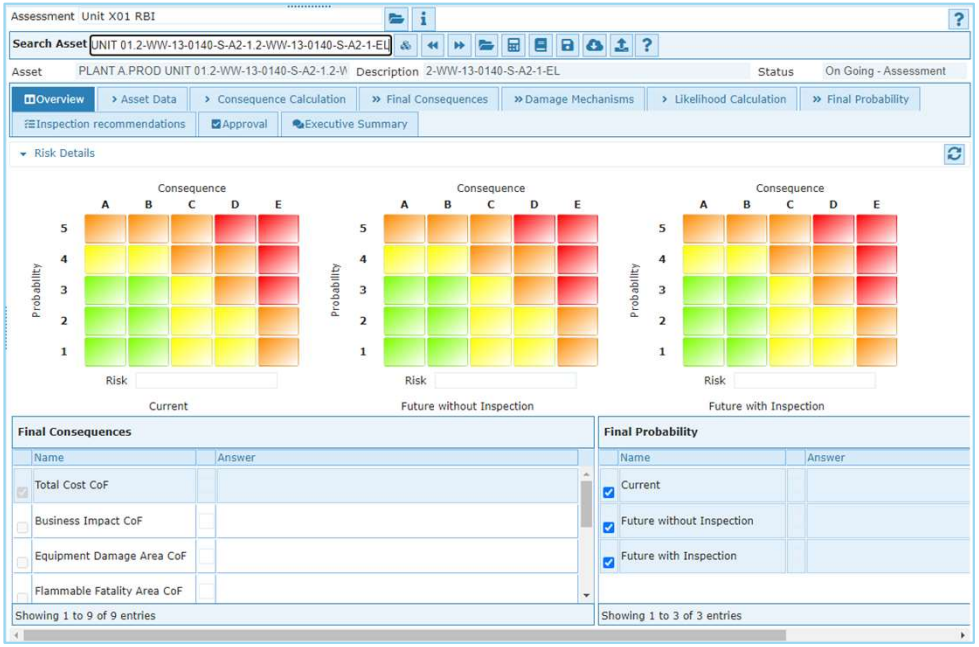
- Once the scope is selected, Next Select the Assessment Method from the tab as shown below:
- It displays all the methods linked to the scope of assets created to do the assessment. If in assessment creation RBI API is checked, by default API 581 critical method will be selected. The main grid shows what is the class and criticality method selected.



Step	Description
1	Filter is used to filter the data based on columns in the grid.
2	Export button is used to export the data to excel.
3	Export All to excel button is used to export the data to excel.
4	Refresh is used to refresh the grid data.

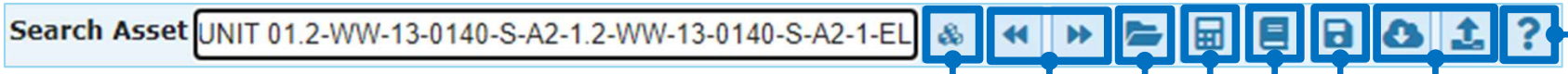
RBI - Assessment

- Once scope, assessment method is defined, user may proceed to perform assessment for the selected assets.
- Can create the assessment at parent level and actual assessment are performed for each element/part.eg if assessment is created at plant level all the elements below the plant will be considered for assessment.
- All the associated data like design data, general data and all the calculation sheets are been shown in the proceeding tabs like asset data, consequence calculation. once all the input data is given can run the assessment as shown below.



RBI - Assessment

- This slide explains about the buttons available while doing the assessment.



1 Overall assessment is click to know the assessment for all the assets in the scope

2 Previous and next button used to seek the assets from the scope while doing individual assessment.

3 Select is used to go to the specific asset from scope.

4 Recalculate is used to recalculate all the formulas and get the risk result.

5 To know the status of the batch calculation.

6 To save the assessment data.

7 To export and import assessment data to and from excel.

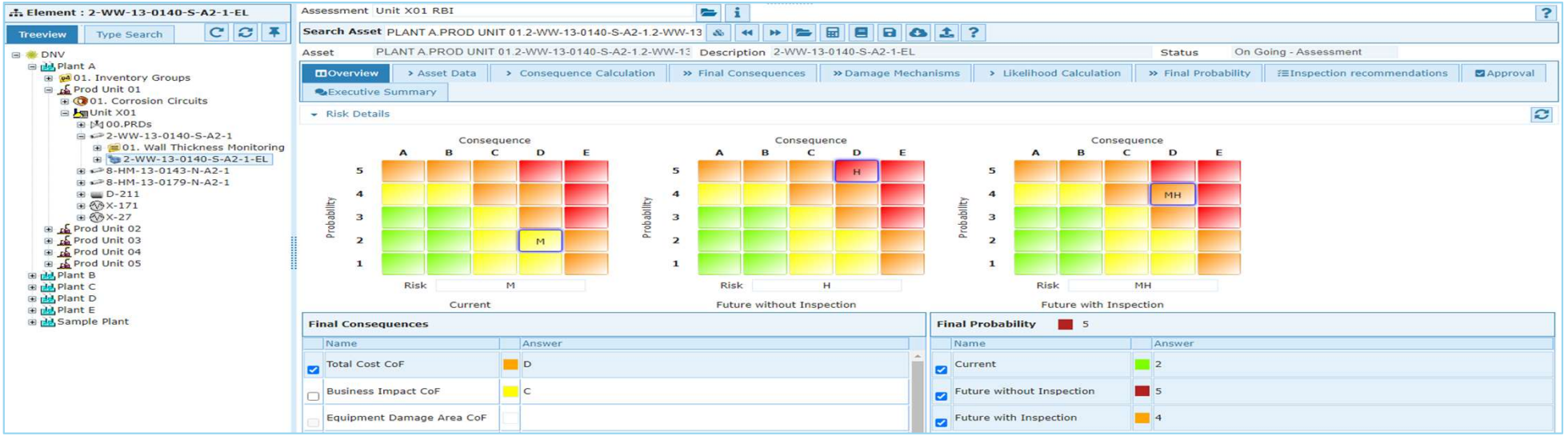
8 To see the help of focus content.

RBI - Assessment

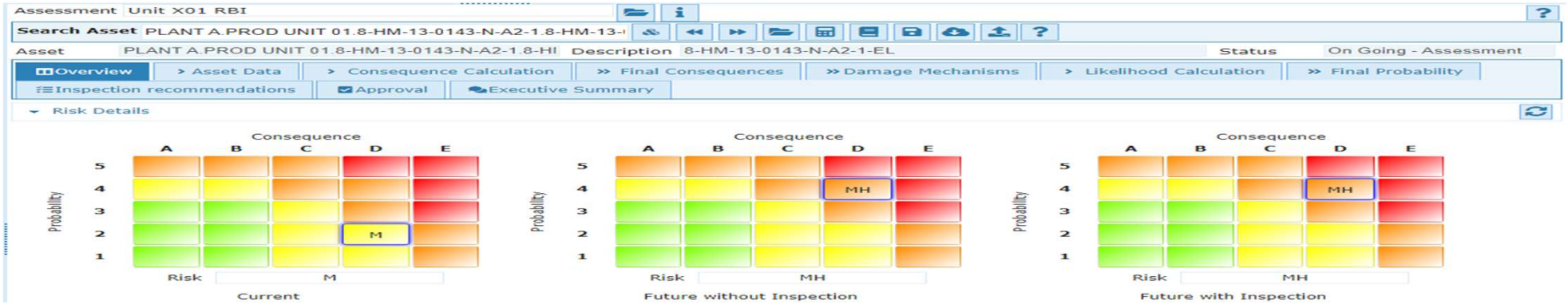
- Overall assessment button is used when the user needs to recalculate and view the assessment result for all the elements in the scope. here assessment is done for all the elements selected in scope.eg if Plant is selected assessment is done for all the elements under that plant as shown below.

RBI - Assessment

- Previous/Next  utton is used when the user needs do the assessment for a single element. To navigate through previous or next element and do the assessment.

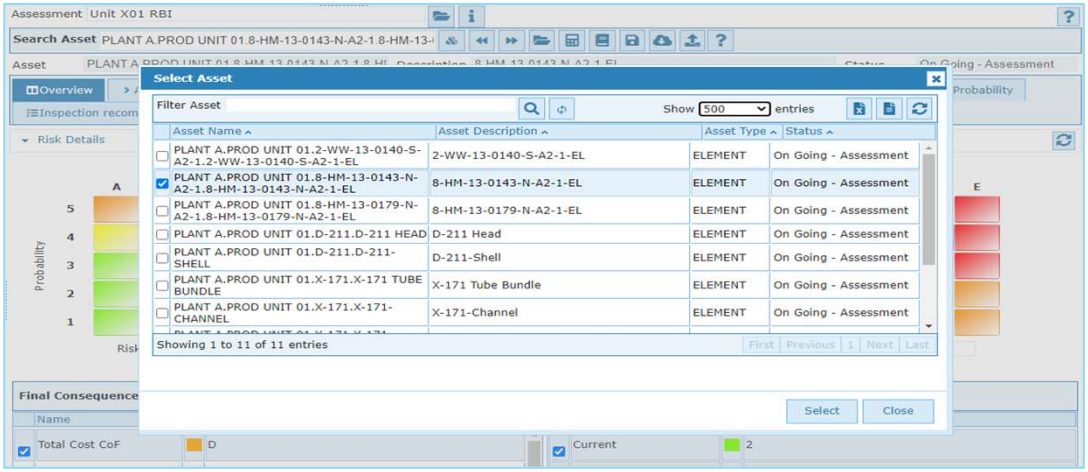


- Once the element is selected then the overview screen shows the result for the specific element as shown below

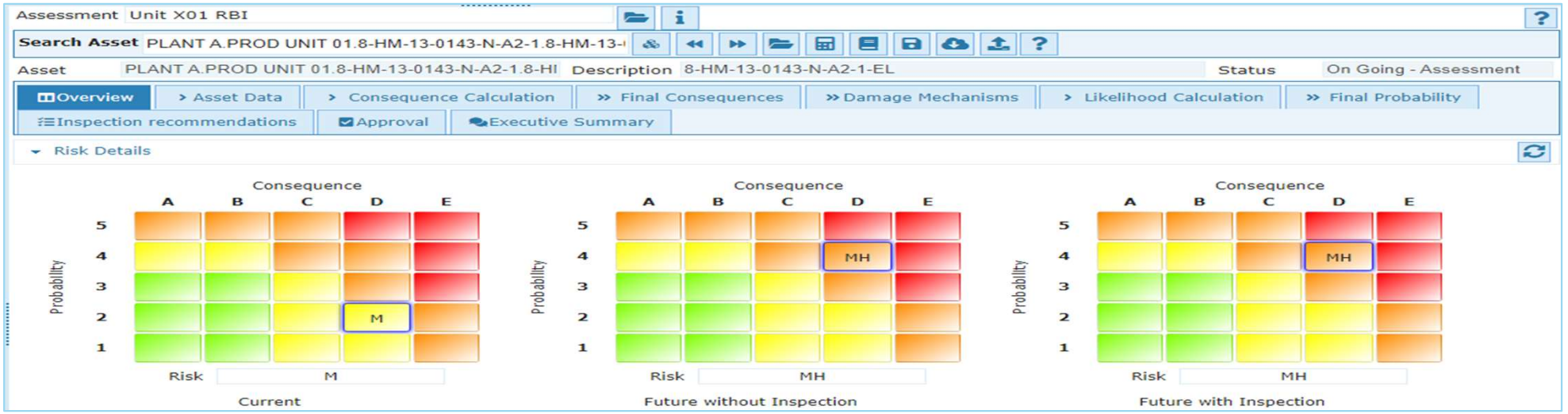


RBI - Assessment

- Select button is used to select the specific element from the list as shown below



- Once the element is selected then the overview screen shows the result for the specific element as shown below

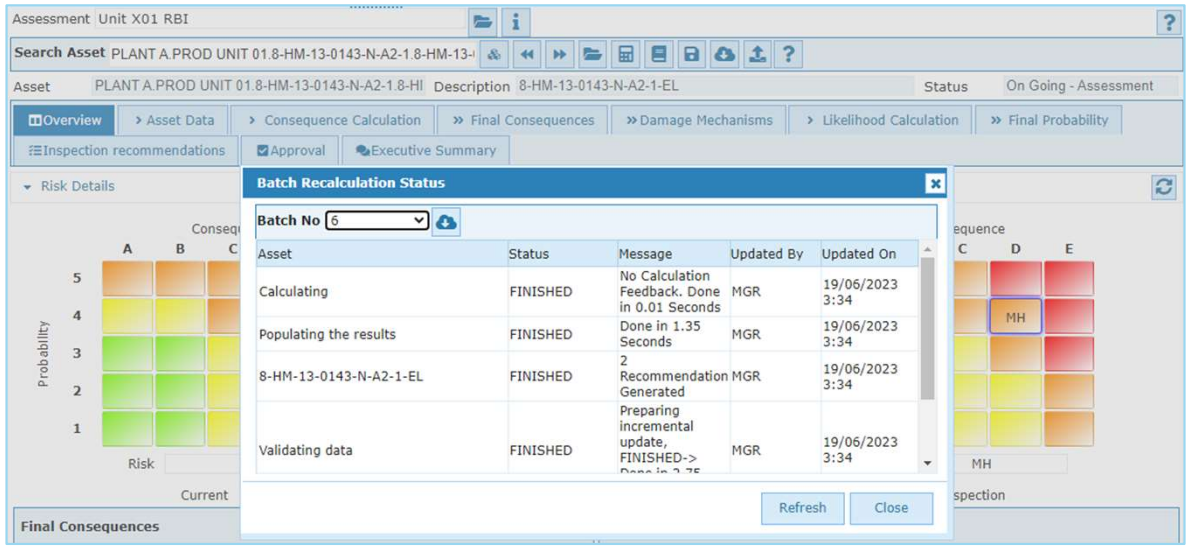


RBI - Assessment

- Recalculate button is used to Recalculate all the calculations and display the risk results. After going thorough validation check the risk results will be displayed.

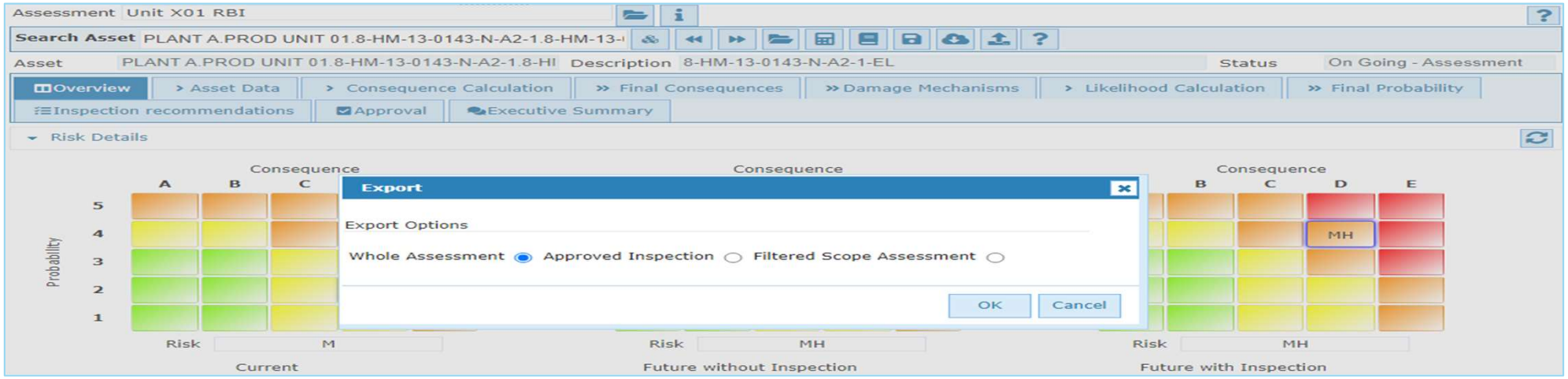
- Batch button is used to know the status of the recalculation.

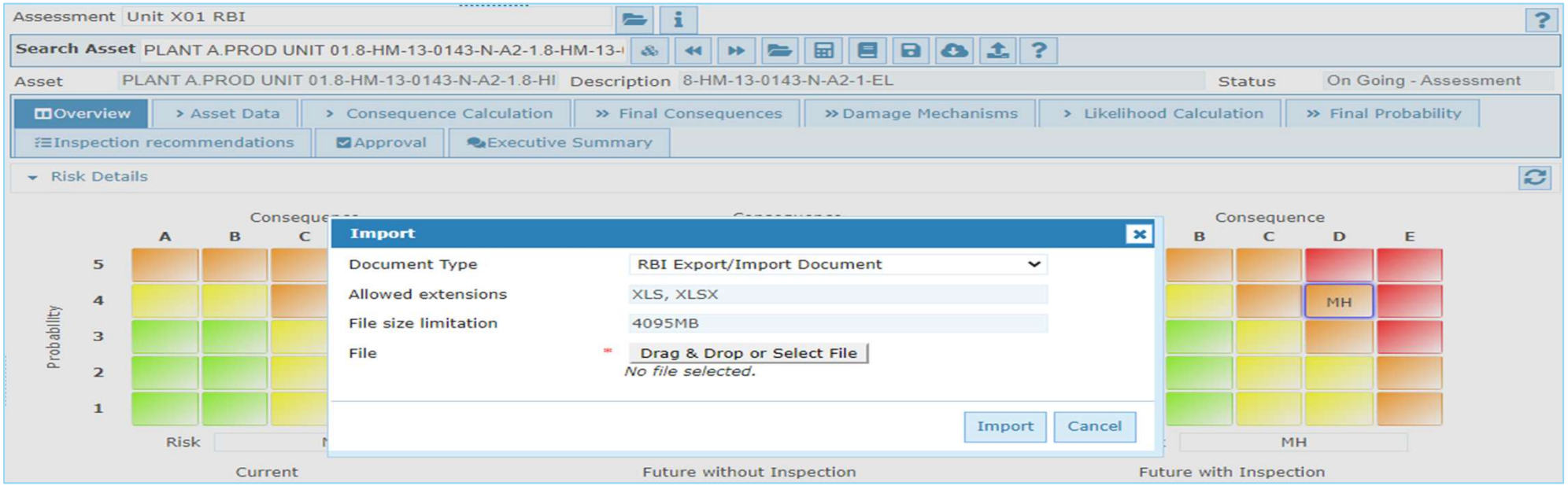
- Save button is used to know save the assessment.



RBI - Assessment

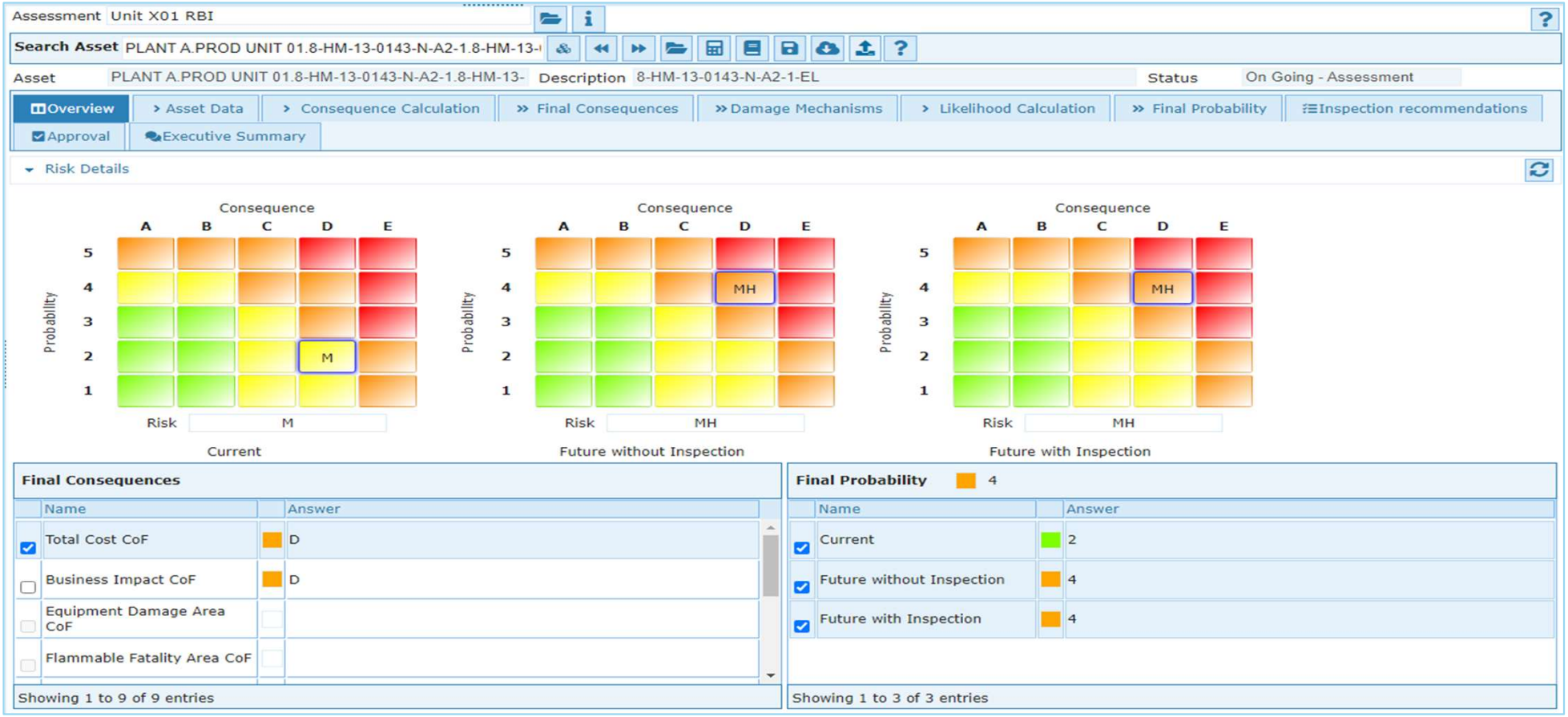
- Export/Import button is used to export and import the assessment data.





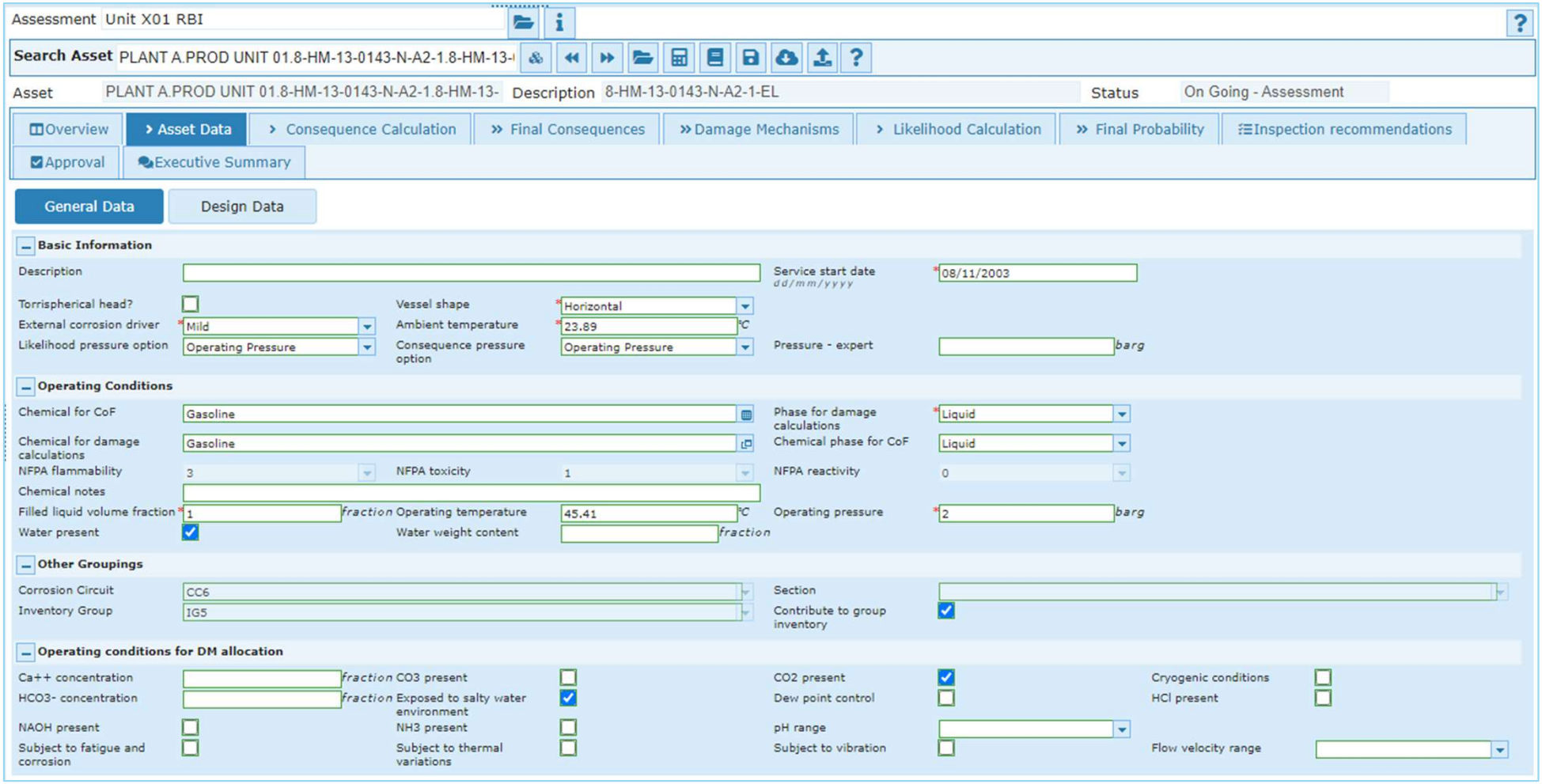
RBI – Assessment-Overview

- Shows the final overview of the risk for the selected Element or for all assets from scope in the form of risk matrix and the consequence of failure and probability of failure data that derived the risk ranking. The risk matrix shown here are for current risk, future risk and future with inspection risk.



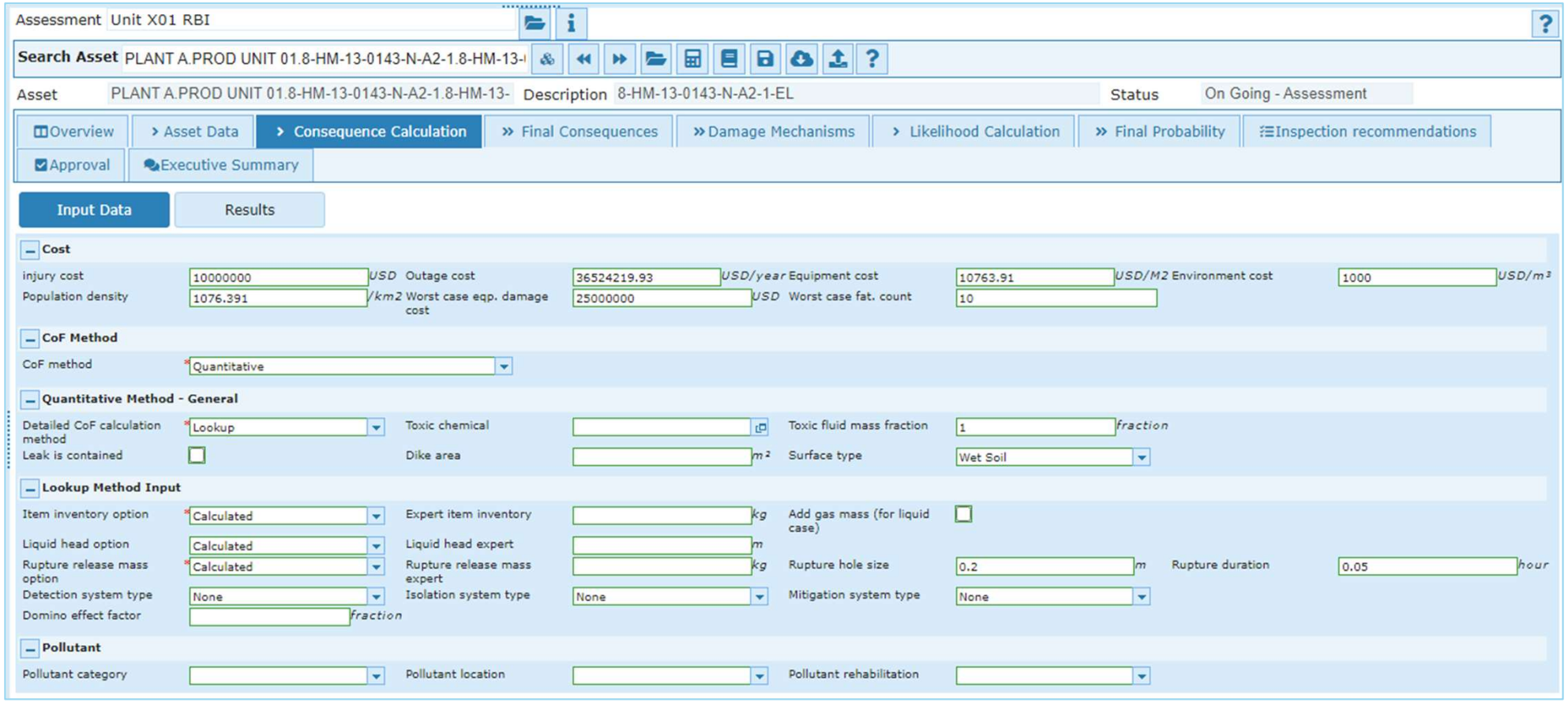
RBI – Assessment-Asset Data

- Shows general and design data of an asset here. can modify the data related to the asset before running the assessment.



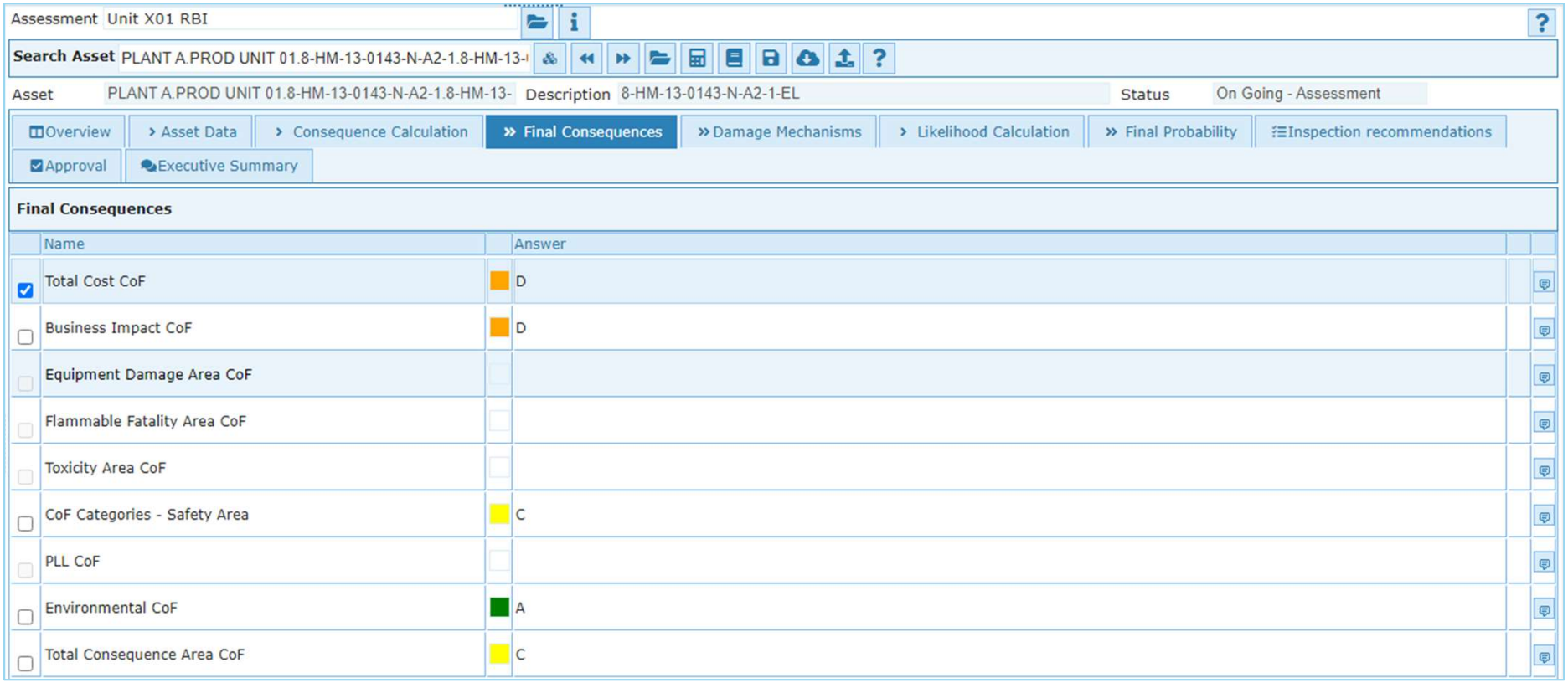
RBI – Assessment-Consequence Calculation

- Consequence calculations has some input data to be filled in and based on the input data the results are shown in result tab after recalculation.



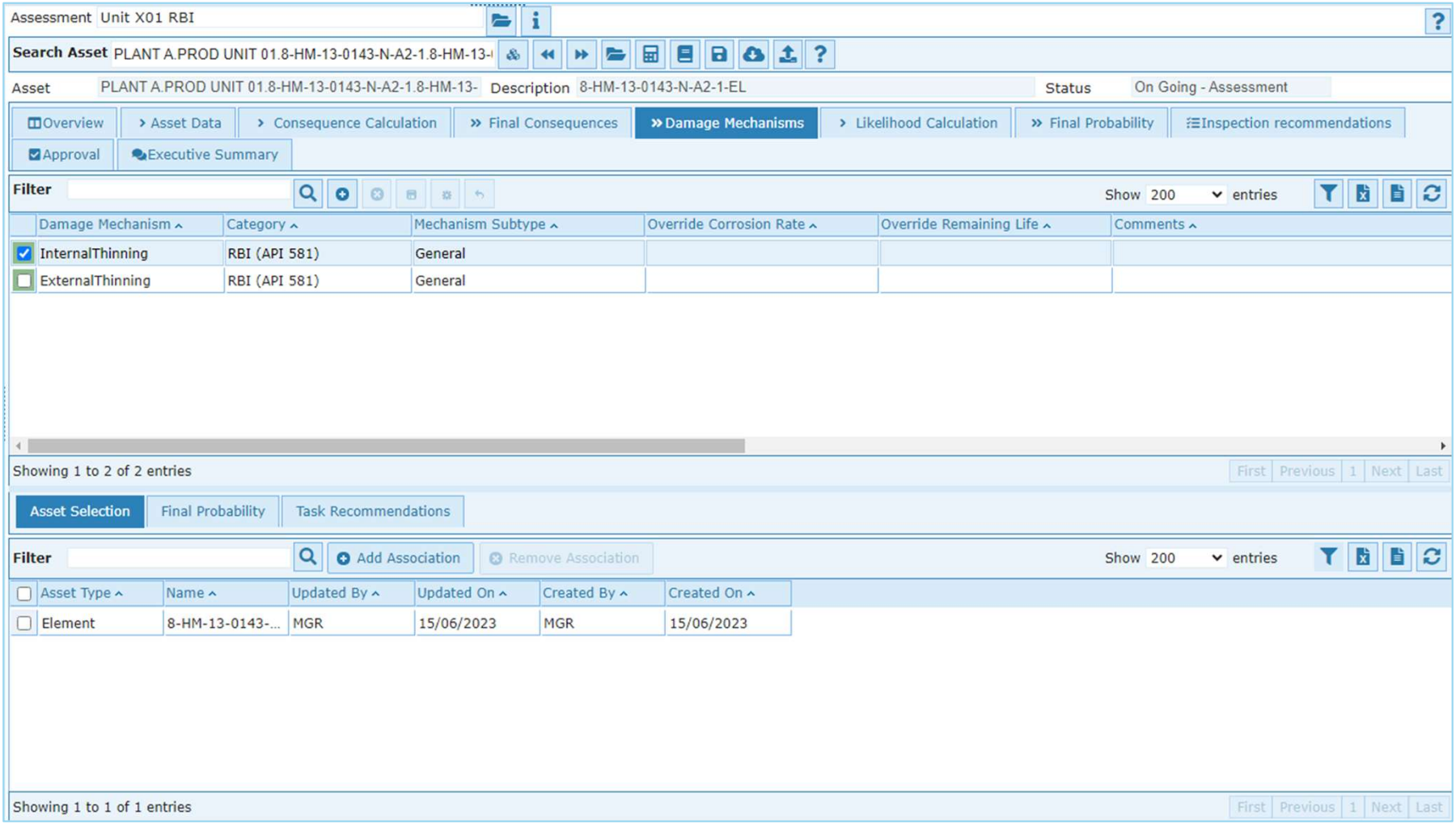
RBI – Assessment-Final Consequence

- A final consequence of failure is calculated from the input datasheets attached to the criticality method. This tab also runs any formula associated with the final COF categories. Or otherwise the category values can be manually selected from the drop-down list also. Each category here can have its own remarks by clicking on the remark button next to each categories.



RBI – Assessment-Damage mechanism

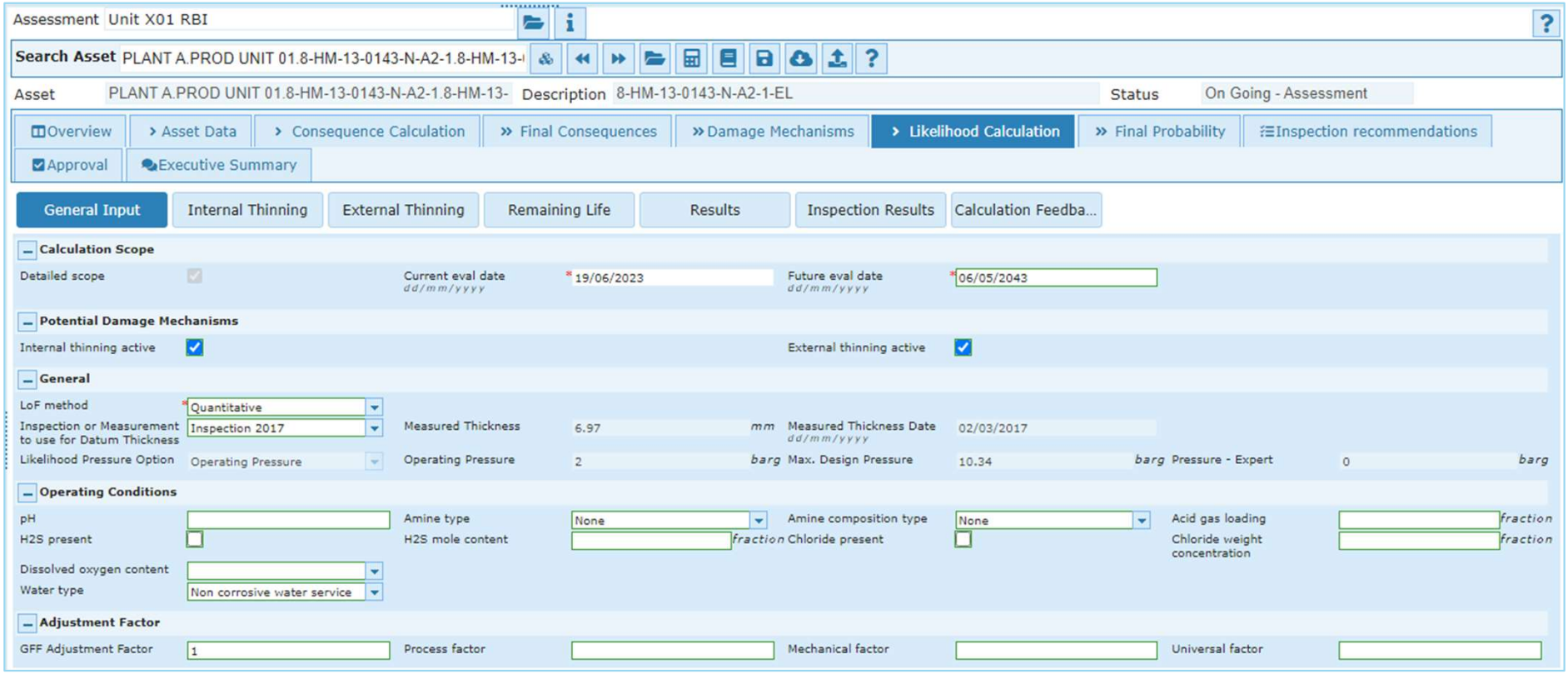
- This screen is used to link failure mechanism to an asset and based on that damage mechanism. The probability and task recommended is also shown here.



SS13
SS14

RBI – Assessment-Likelihood Calculation

- Likelihood calculations has some input data to be filled in and based on the input data the results are shown in result tab after recalculation. Also inspection results can be seen here.



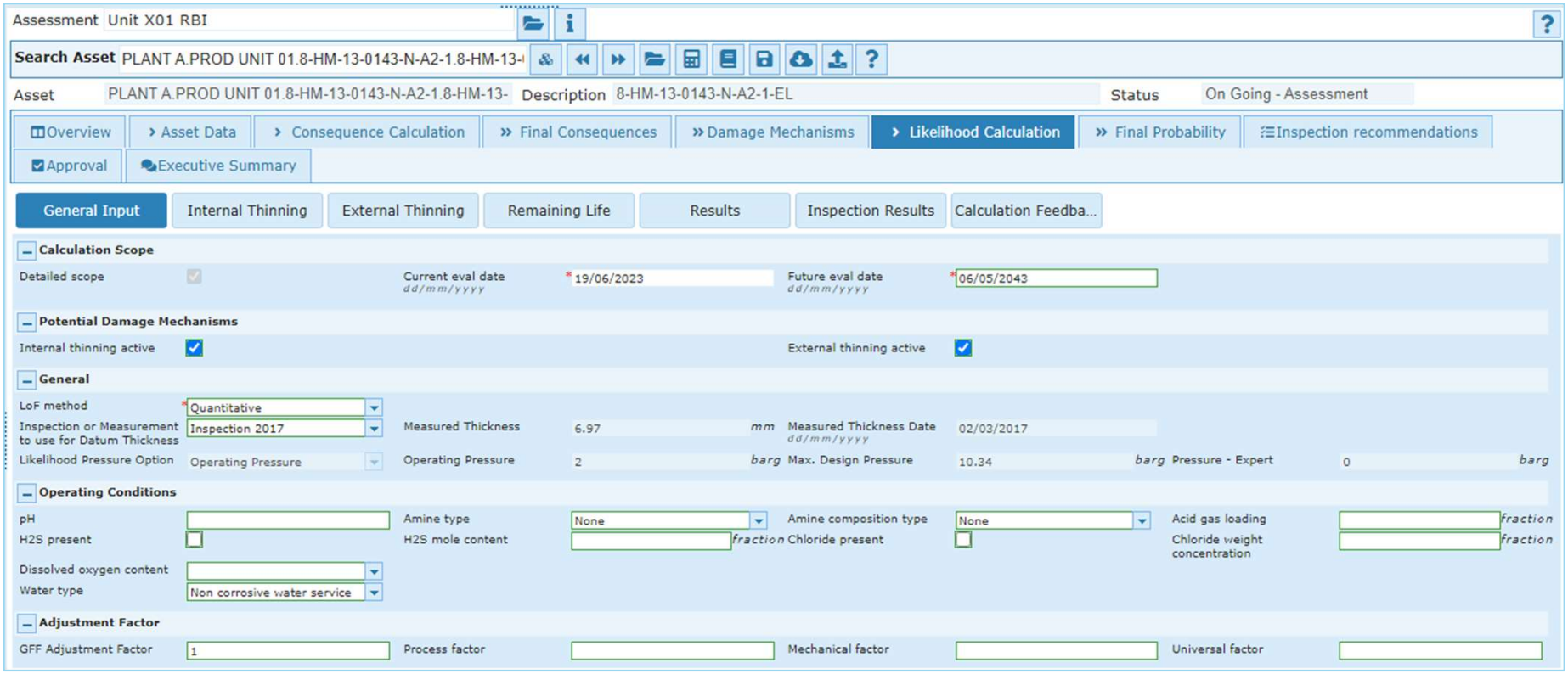
Slide 27

SS13 Shinde, Suhasini, 28/8/20

SS14 need to add slides for general input, internal thinning etc..
Shinde, Suhasini, 28/8/20

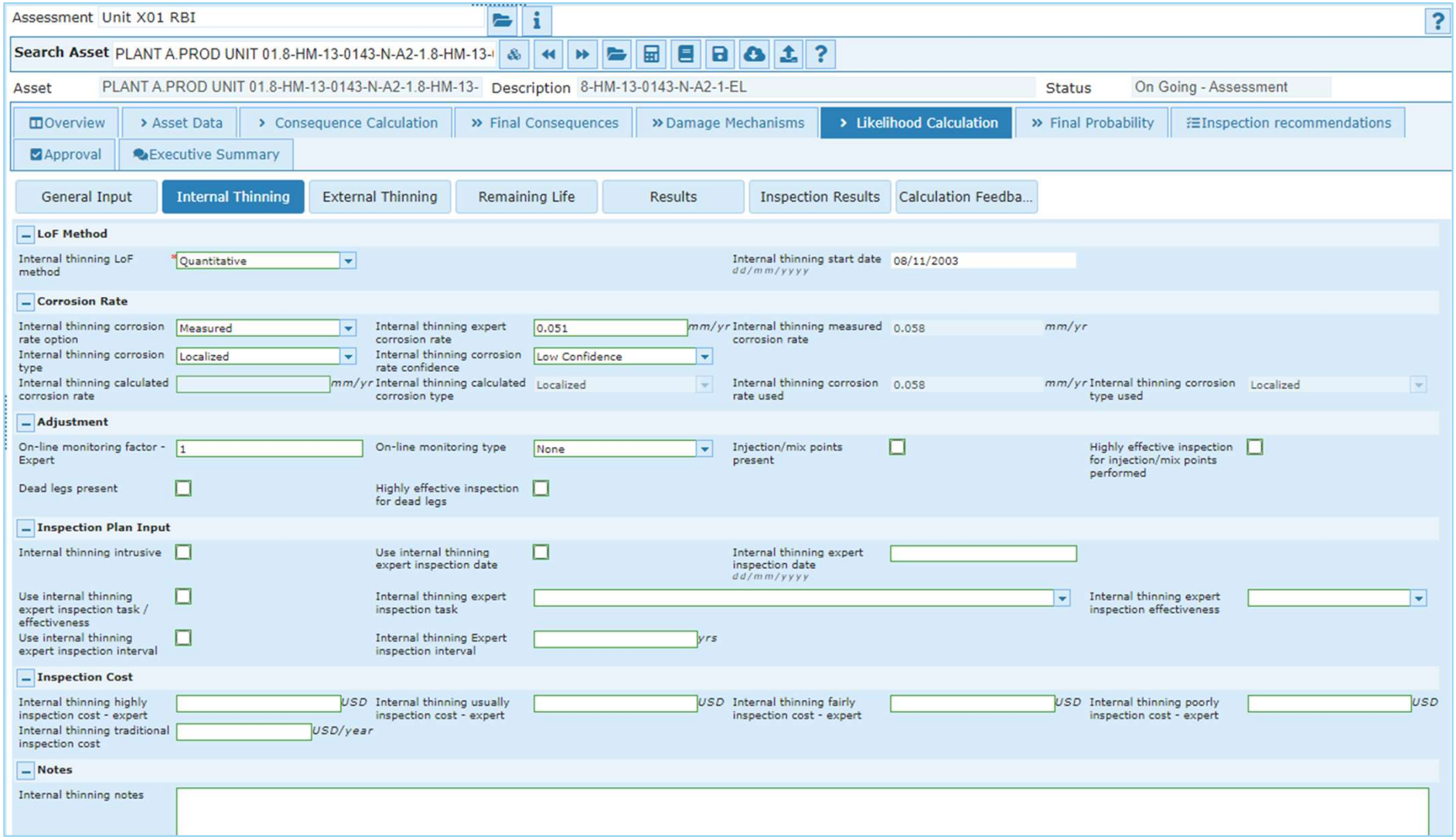
RBI – Assessment-Likelihood Calculation-General Input data

- There are some General input data to be filled as shown below:



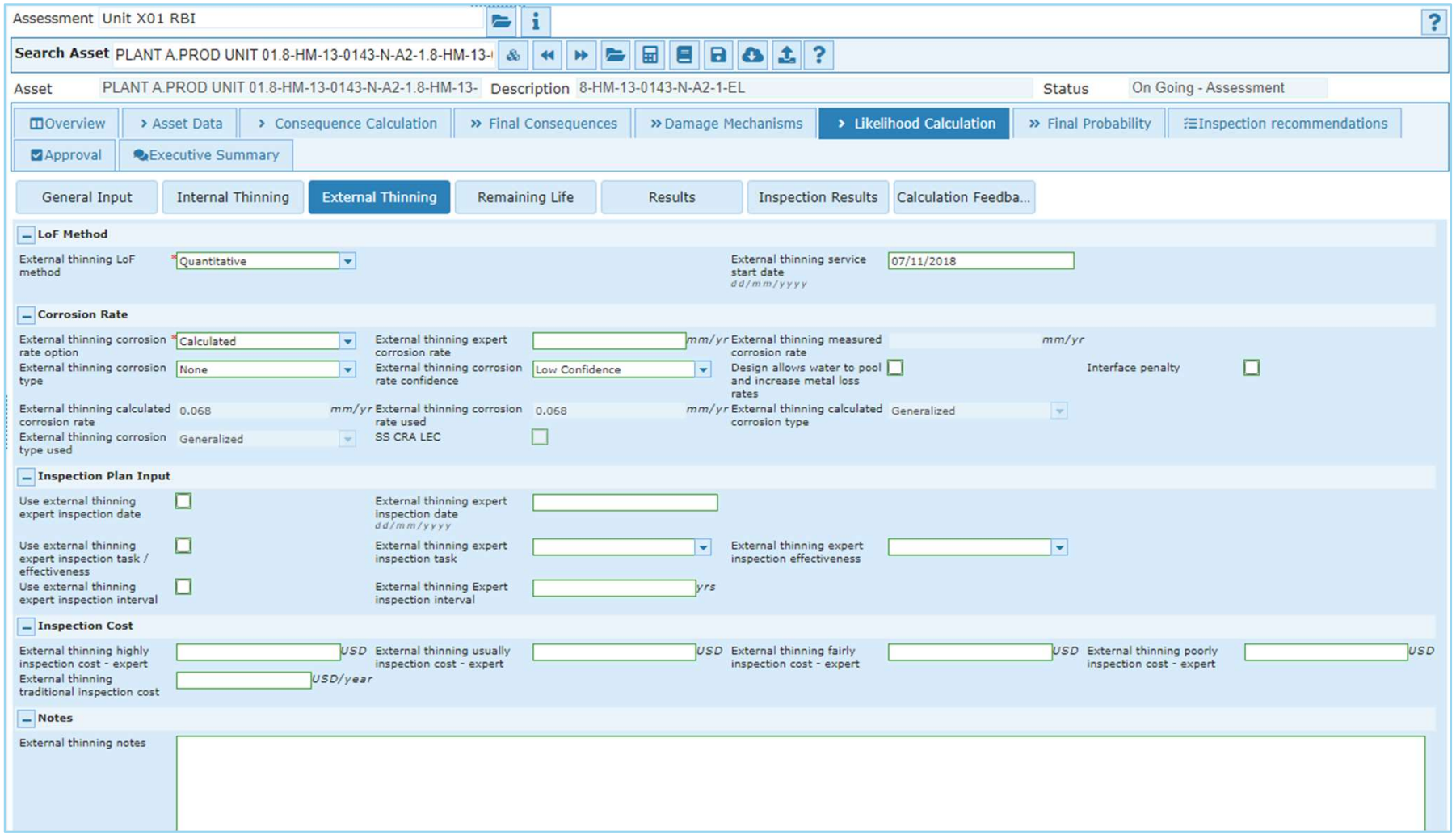
RBI – Assessment-Likelihood Calculation-Internal Thinning

- Internal thinning related data to be filled in this section as shown below.



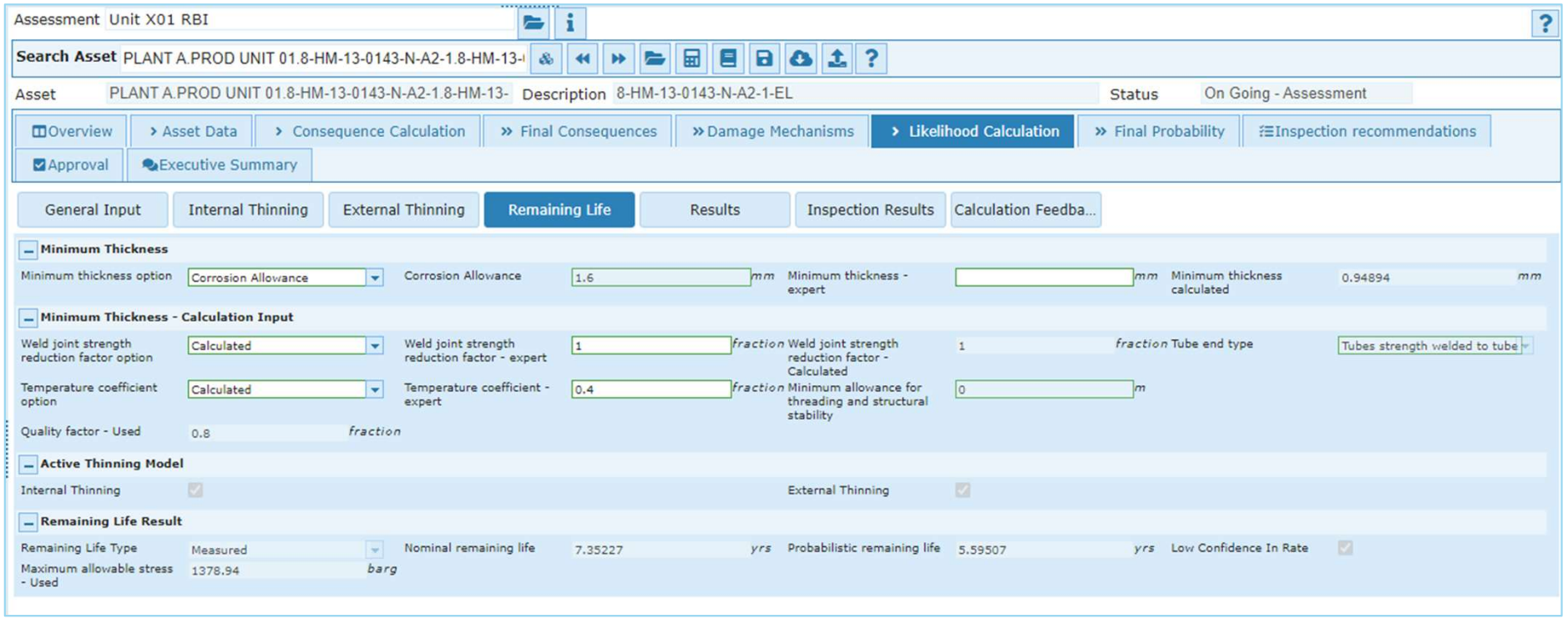
RBI – Assessment-Likelihood Calculation-External Thinning

- External thinning related data to be filled in this section as shown below.



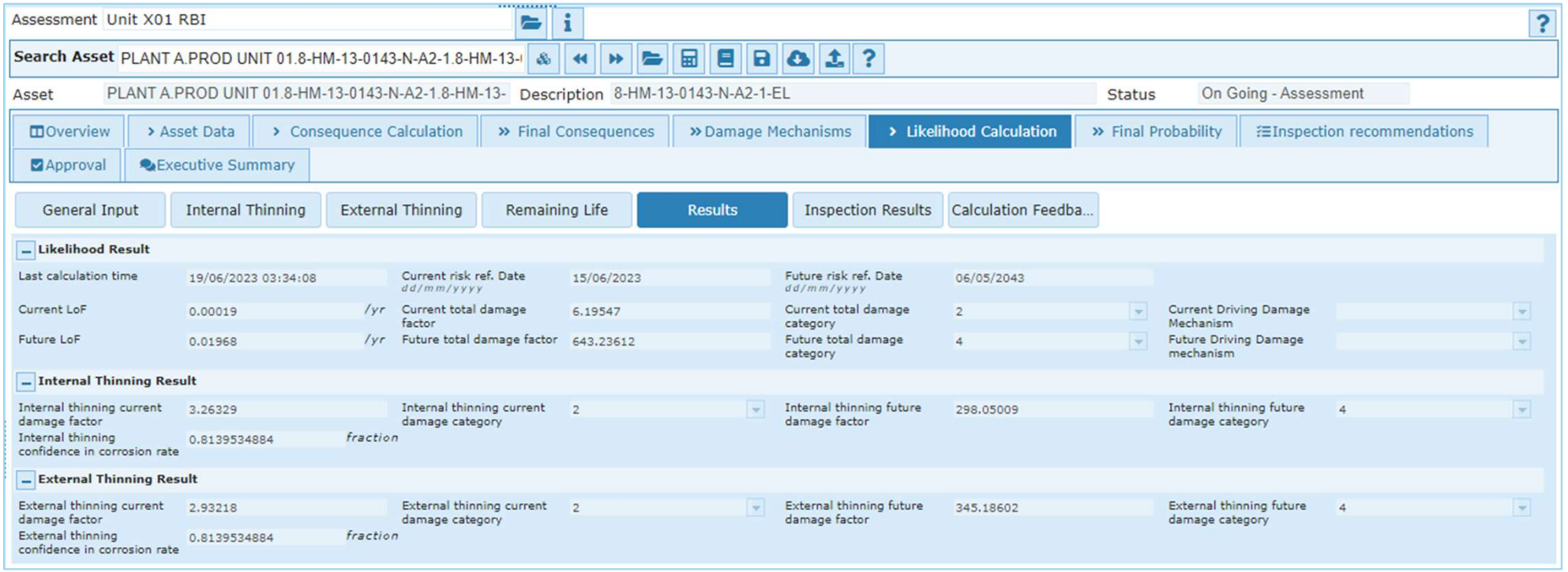
RBI – Assessment-Likelihood Calculation-Remaining life

- Remaining Life related data to be filled in this section as shown below.



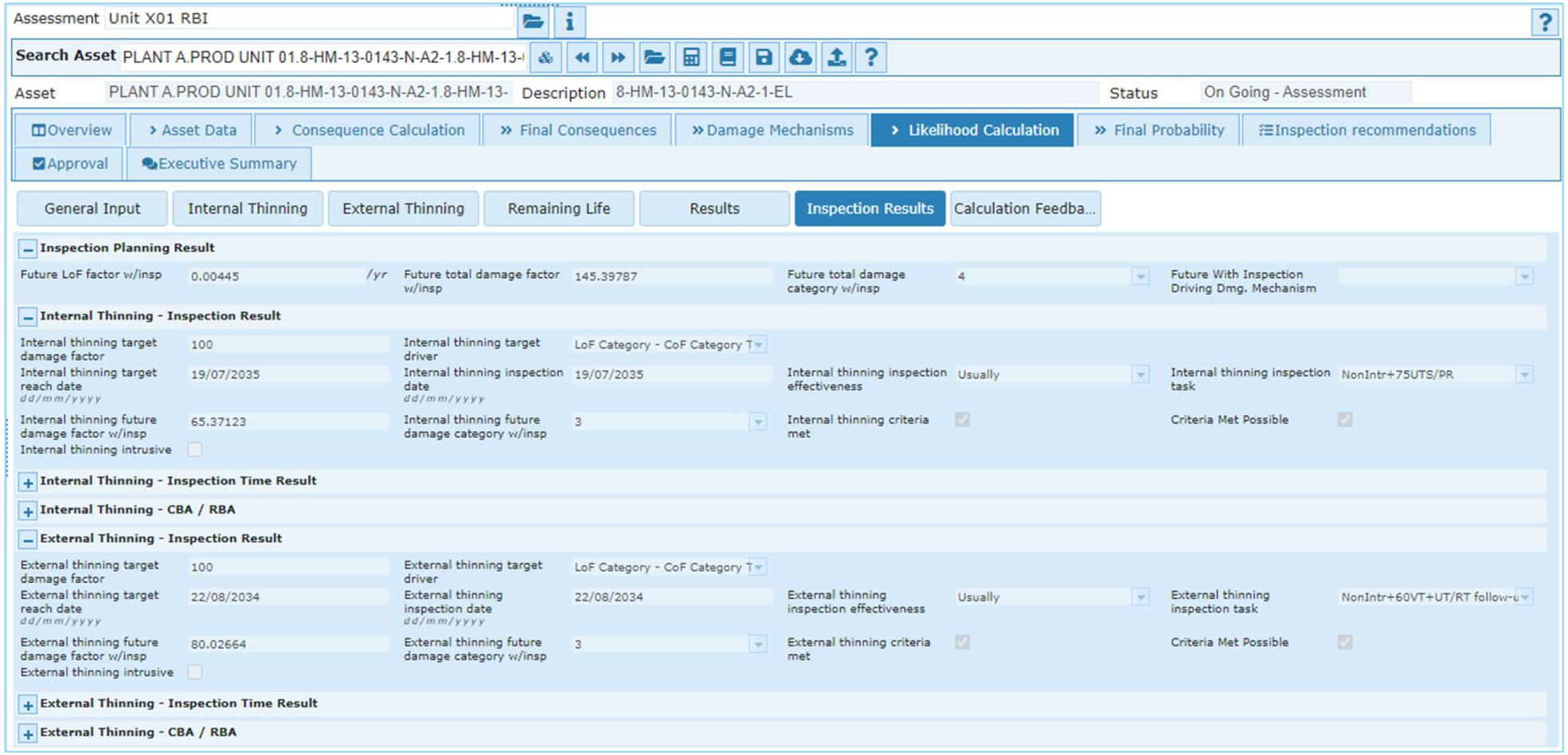
RBI – Assessment-Likelihood Calculation-Results

- Likelihood calculation results are shown below.



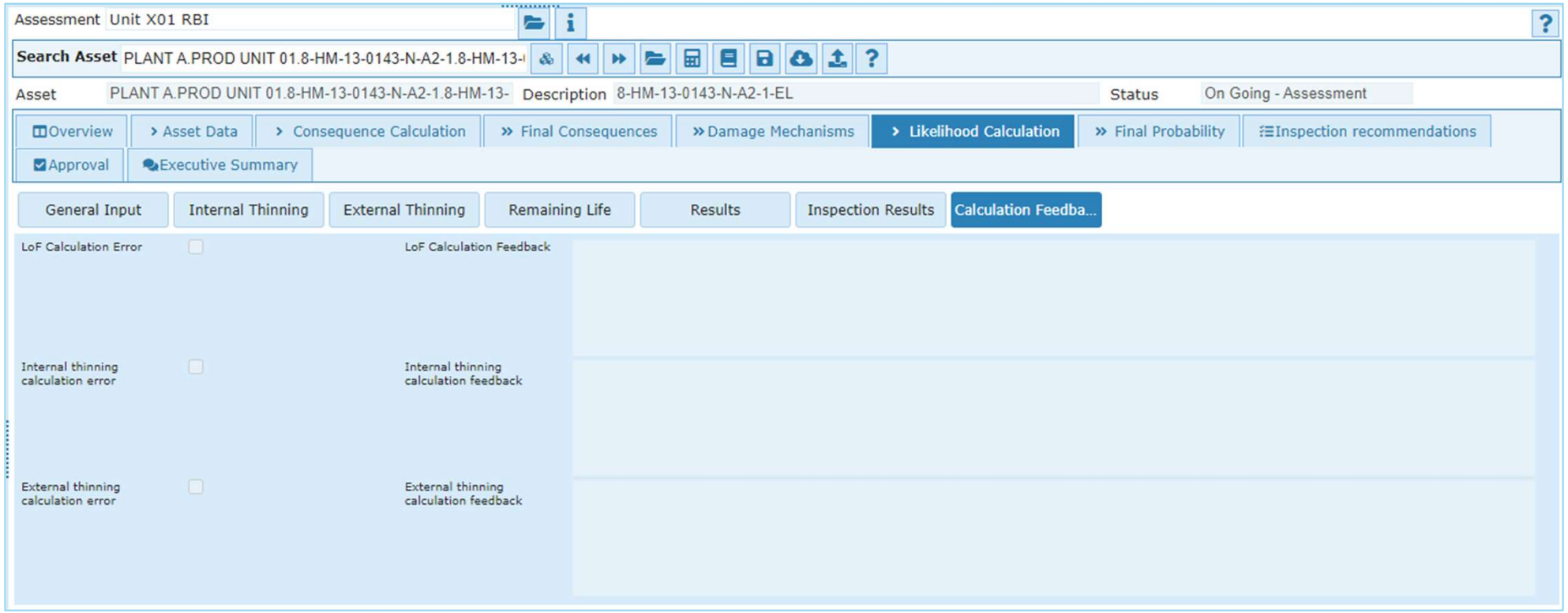
RBI – Assessment-Likelihood Calculation-Inspection Result

- Inspection results data are shown below.



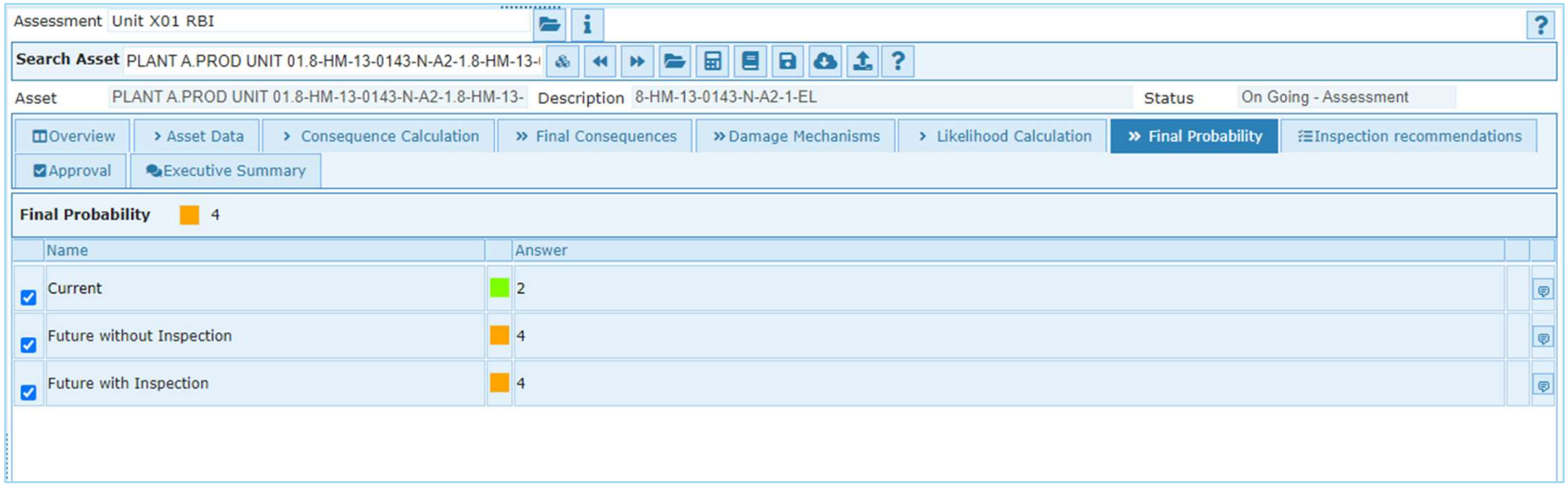
RBI – Assessment-Likelihood Calculation-Calculation Feedback

- Calculation feedback can be provided in this section as shown below.



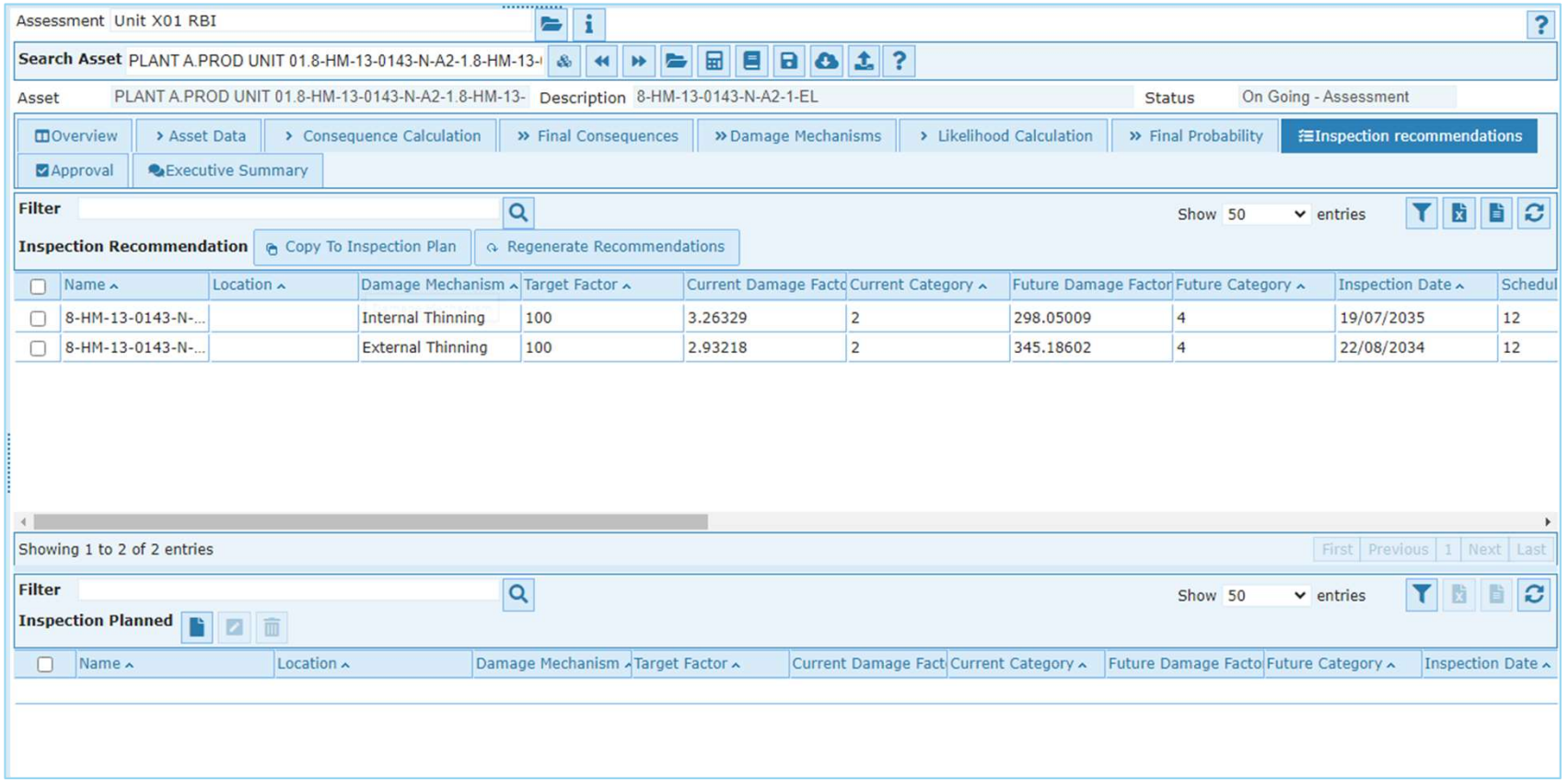
RBI – Assessment-Final Probability

- A final probability of failure is calculated from the input datasheets attached to the criticality method. This tab also runs any formula associated with the final POF categories. Each category here can have its own remarks by clicking on the remark button next to each categories.



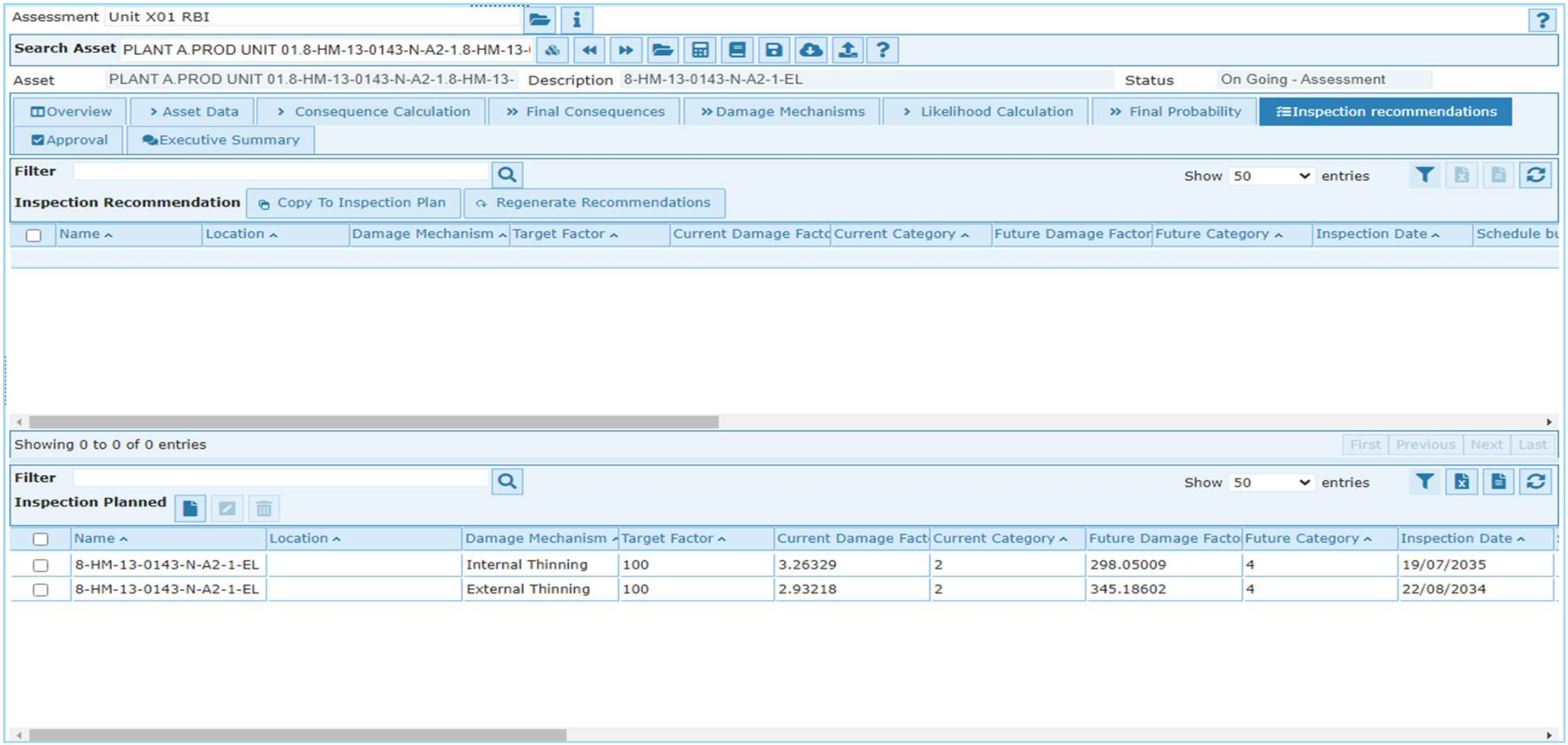
RBI – Assessment-Inspection Recommendation

- Once final risk value is calculated the inspection selection is normally performed. Based on the criteria like FM, risk value, COF POF value, design data inspection recommendations are listed here. Here can select the inspection recommendation and copy it to our inspection plan. Also can regenerate recommendation by clicking Regenerate recommendation button as shown below.



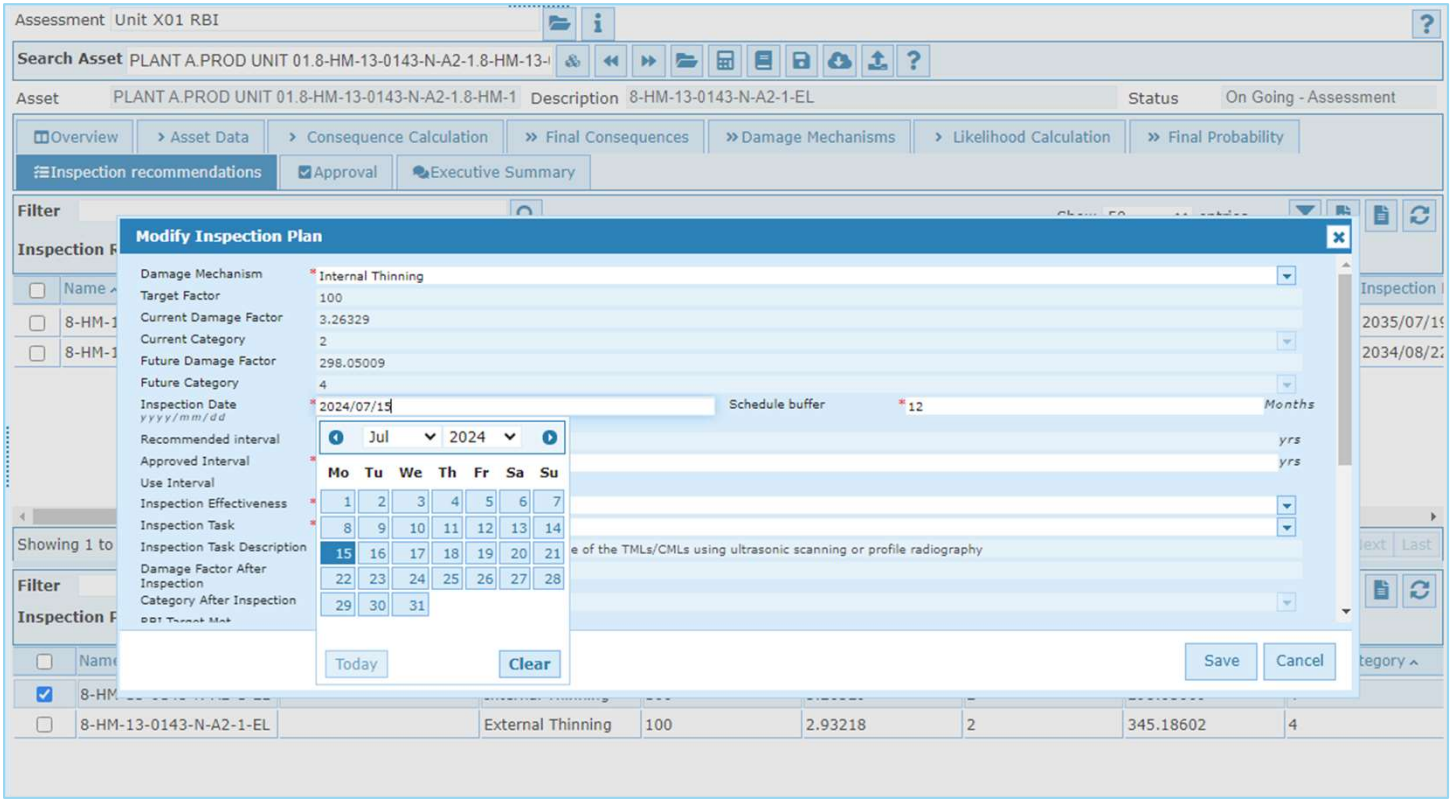
RBI – Assessment-Inspection Recommendation

- Select the recommended inspections and click Copy To Inspection Plan. This will move the selected inspections to the Inspection Planned data.
- When the Inspection Planned data are approved, they will be ready for approval.



RBI – Assessment-Inspection Recommendation

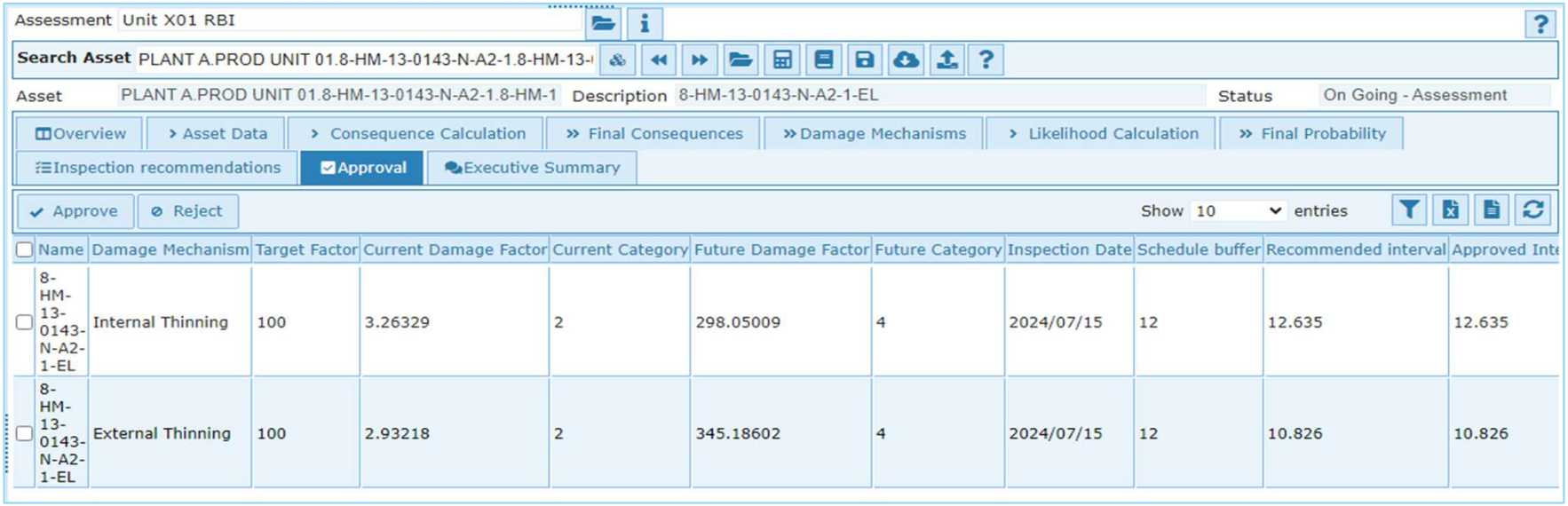
- Select one inspection planned data to modify the data if needed.
- For testing purpose to have inspection activity generated, the inspection date minus schedule buffer must be before today so the inspection is due to be created.
- Remember to save the assessment data when modification is done.



- Sample RBI data
  - RBI Recom. Date: 2024/07/15
  - Schedule Buffer: 12 Months
  - Scheduled Date: 2023/07/15
- Sample Plan data
  - Plan User Date: 2023/07/20
  - Plan Lead Time: 1 Month
  - Plan Creation Date: 2023/06/20

RBI – Assessment-Approval

- Inspection planned data will be shown in the Approval tab for approving the RBI recommended inspections.
- Select the inspections and click Approve button to approve the inspections.
- When approving the inspections, you can specify a comment.
- For approved inspections you can also select and reject them.

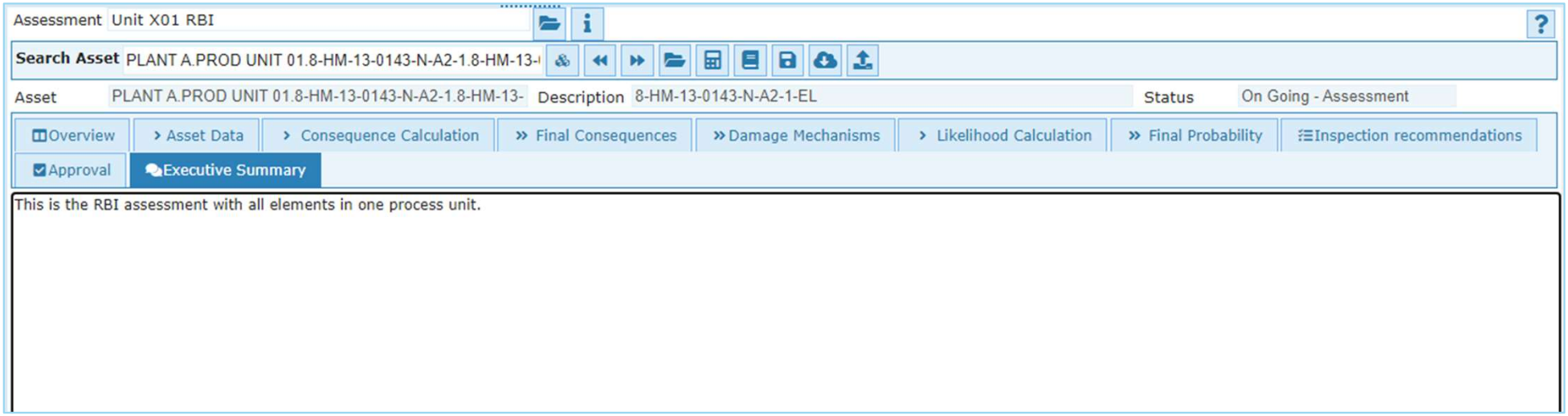


Name	Damage Mechanism	Target Factor	Current Damage Factor	Current Category	Future Damage Factor	Future Category	Inspection Date	Schedule buffer	Recommended interval	Approved Inte
8-HM-13-0143-N-A2-1-EL	Internal Thinning	100	3.26329	2	298.05009	4	2024/07/15	12	12.635	12.635
8-HM-13-0143-N-A2-1-EL	External Thinning	100	2.93218	2	345.18602	4	2024/07/15	12	10.826	10.826

- To synchronize sample RBI inspections to Tag inspection plan, approve the RBI inspections AFTER the Tag inspection plan is created.

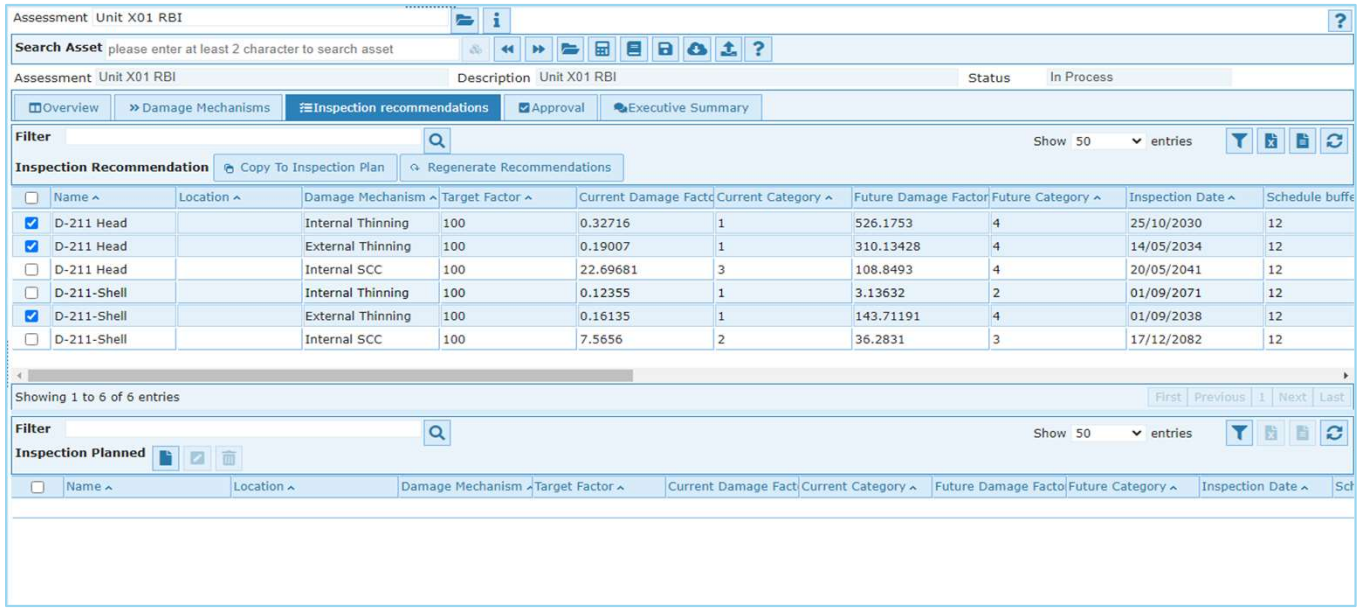
RBI – Assessment-Execute summary

- Once Risk is evaluated an Executive summary can be written for the final risk observations, reasons and evidences. This could be submitted in a reporting format to the client at the end of the RBI project. User should enter the executive summary and click on the Save Icon button to save the updated summary.



RBI – Assessment-Multiple Elements on a Tag

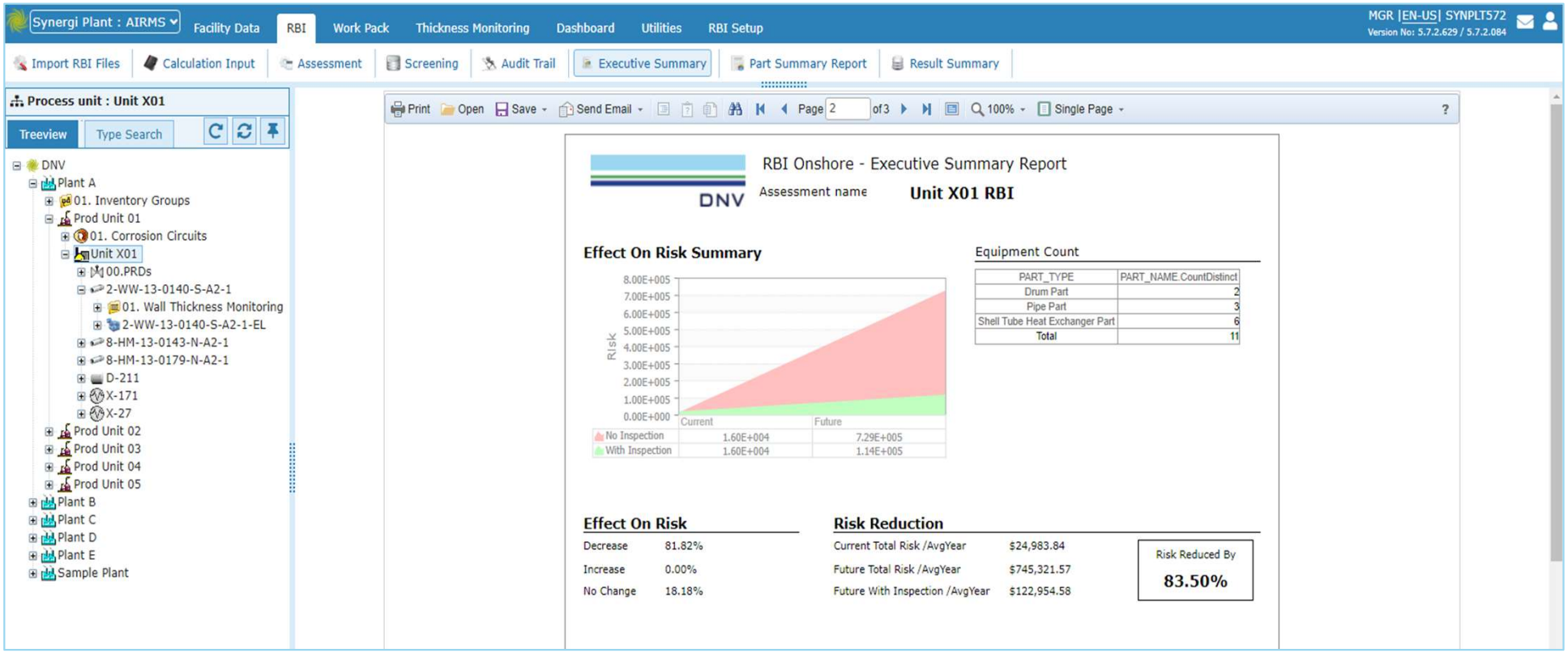
- When a Tag has multiple Elements, you can focus on the Tag in the asset tree, and go to the Inspection Recommendations to process all recommended inspections for all elements together.
- This includes copy inspections to the inspection planned data and perform approval on them.



- Sample RBI data
  - RBI Recom. Date: 2024/07/15
  - Schedule Buffer: 12 Months
  - Scheduled Date: 2023/07/15
- Sample Plan data
  - Plan User Date: 2023/07/20
  - Plan Lead Time: 1 Month
  - Plan Creation Date: 2023/06/20

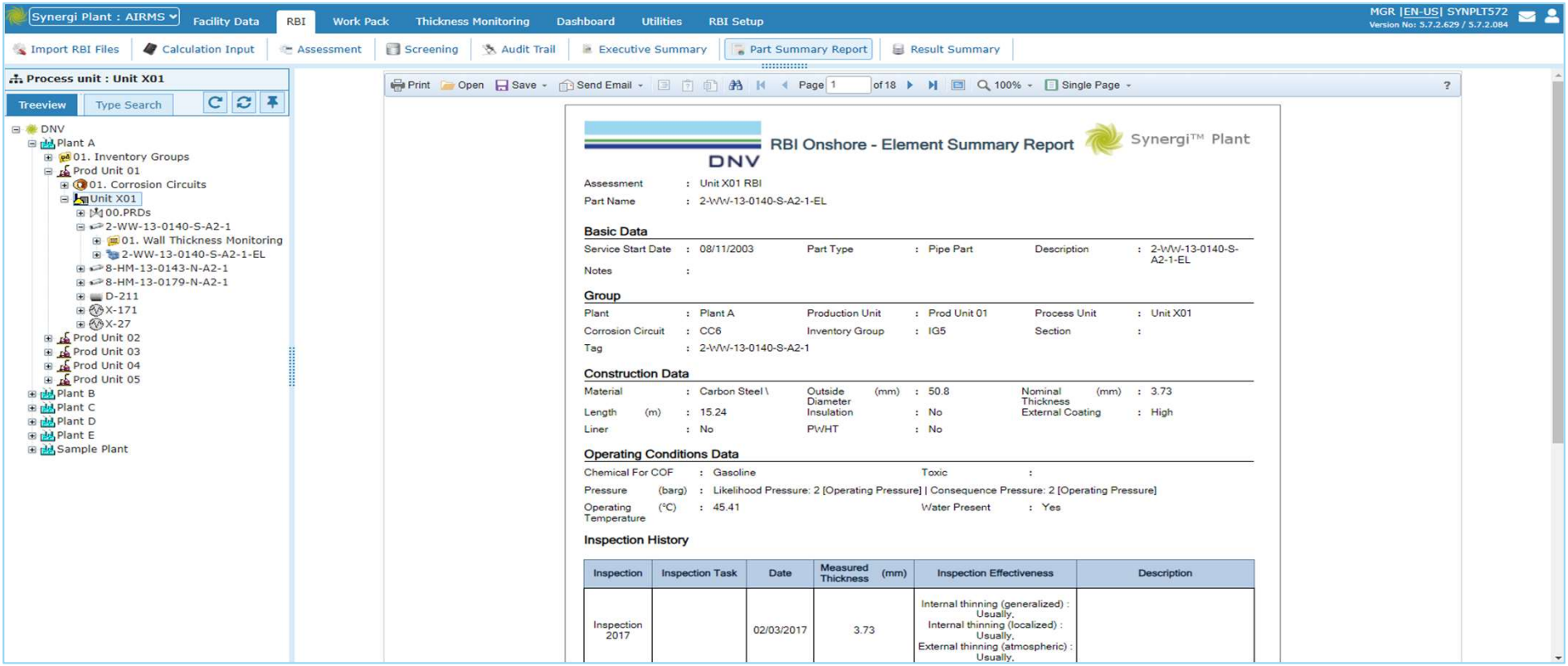
RBI- Reports-Executive Summary Report

- Once the assessment is done, the user can get the Executive summary report as shown below:
- Select Tree-> Asset-> Based on the asset, executive summary for all the assessment which are linked to that asset are shown.
- Navigation path: AIRMS->RBI->Executive Summary



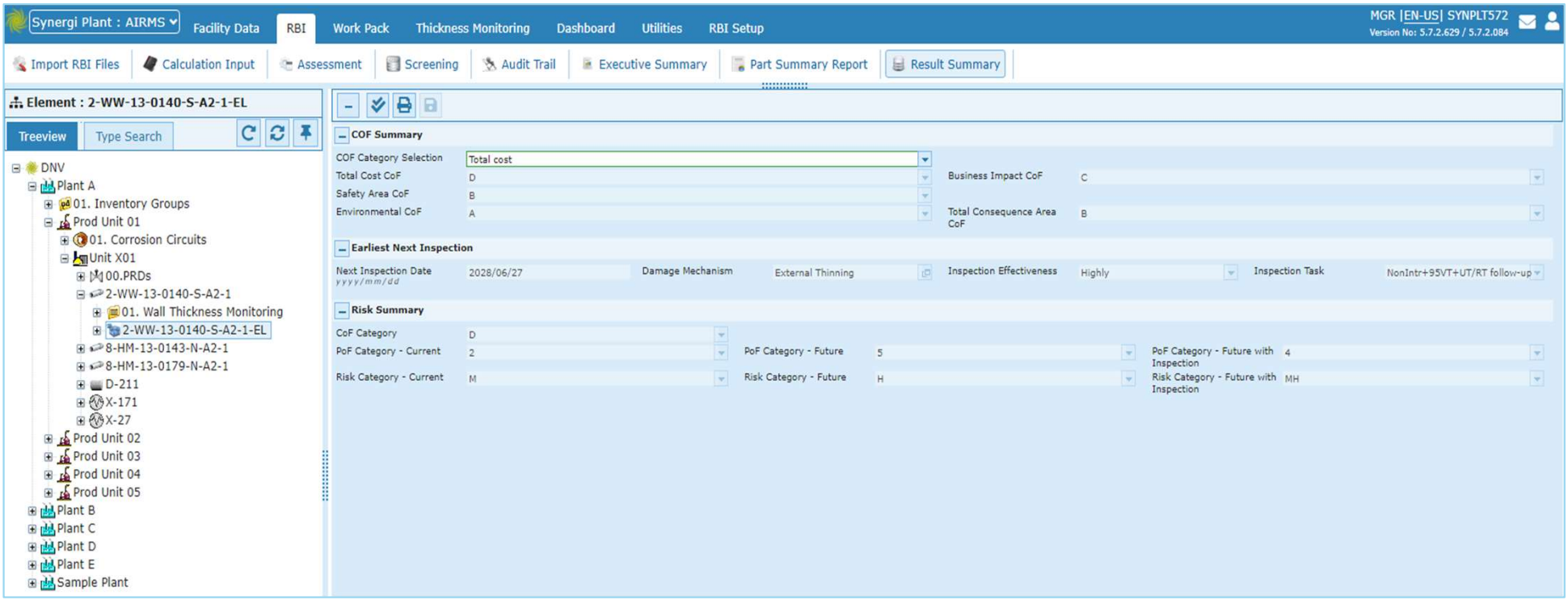
RBI- Reports-Part Summary Report

- Once the assessment is done, the user can get the Part Summary Report as shown below:
- Select Tree-> Asset-> Based on the asset, executive summary for all the assessment which are linked to that asset are shown.
- Navigation path: AIRMS->RBI->Part Summary Report



RBI- Reports-Result Summary

- Once the assessment is done, the user can get the Result Summary as shown below. The result summary is the asset datasheet which store the latest RBI result for the element. It serve the quick data reference for risk summary data.
- Select one Element on the asset tree.
- Navigation path: AIRMS->RBI->Result Summary



Synergi Plant Training

Tommy Tang
Tommy.Tang@dnv.com
+65-8699-5620, +886-983-007388

www.dnv.com

SAFER, SMARTER, GREENER