

First Steps Example



XFMEA

VERSION 2021

ReliaSoft

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Introduction

This example provides a quick introduction to the XFMEA software by allowing you to experiment with the application's data management, analysis and reporting features. For this example, you will work with a project that is based on the design FMEA example that is included in Appendix G of the 2009 revision of the SAE J1739 Surface Vehicle Standard guidelines. These instructions were prepared with XFMEA 2021, but you can perform the same steps in previous versions back to Version 9. The appearance of a few icons and interfaces will vary slightly.

Open an Existing Database

If you haven't started XFMEA already, browse for and select the XFNEA application in the Windows Start menu.

When you launch XFMEA, the Backstage view (File tab) is the first view you will see. This Backstage view provides a quick way to create and open databases. In ReliaSoft desktop applications, standard databases are Microsoft Access® databases. These are easy to create and maintain without any special IT infrastructure or support, but there are limitations to the amount of data they can store and the number of users who can access the database simultaneously. Enterprise databases require implementation of Microsoft SQL Server® or Oracle® (which require separate licensing, support and maintenance), but are a more robust platform that can store much more analysis information in the same database and support access by many more simultaneous users.

For this example, you will use a standard database that is installed with the software (called "XFMEA21_Examples.rsgz21") that contains several sample projects. (If you are using Version 2020, the file is called "Xfmea20_Examples.rsgz20," and so on.) To access this file, choose **File > Help**, click **Open Examples Folder**, then browse for the file in the XFMEA sub-folder.

Tip: To preserve the integrity of the shipped example files, the software creates a copy of the file each time you access a database in the Examples folder. The copy has the same name as the original file and is saved in the default documents folder for your computer (e.g., My Documents\ReliaSoft\Files). Use the copy to work on the example projects and save your changes. Any changes you make in the copy will not affect the original file.

View the Project Properties

In all ReliaSoft desktop applications, *projects* give you the flexibility to manage your analyses to fit the particular needs of your organization. You can have one or many projects in the same database.

Every XFMEA analysis within a given project will have the same configurable settings, including the fields that are enabled/disabled in the interface and reports, the rating scales or questions that are available for risk assessment and the options that are available for codified information (such as Action Categories, Classification labels, etc.).

To save time and ensure consistency, these configurable settings can be set automatically based on predefined *profiles* that are managed by authorized users. They can also be viewed or modified directly in each individual project.

- Select the **Design FMEA - Automotive Driveshaft Component (J1739)** project in the Project Manager and choose **Project > Management > Edit Project Properties** to open the Project Properties window, as shown next.

Edit Project Properties (Project: Design FMEA - Automotive Driveshaft Component (J17...

General | Configurable Settings

Name
Design FMEA - Automotive Driveshaft Component (J1739)

Description
This project is based on the Design FMEA example that is included in Appendix G of the 2009 revision of the SAE J1739 Surface Vehicle Standard guidelines.

Remarks
Disclaimer: Example projects are purely for illustrating software features and functionality. They are not intended to accurately represent any real physical process or real data.

Proprietary Label

FMEA Structure
Grouped Effects and Causes

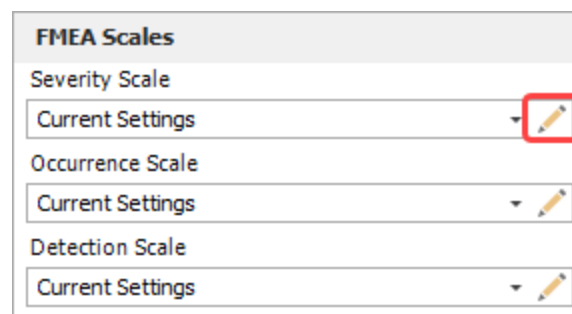
Select Profile from Library
[Based on DFMEA: J1739 (2009)]

Project Category
Design FMEA

Project Owner: HBM Prencsia
Last Updated: 11/5/2019 3:17 PM User: HBM Prencsia

As you can see in the **Select Profile from Library** field, the configurable settings in this project are based on the DFMEA: J1739 (2009) profile. This predefined profile is shipped with the software and can be used to quickly configure the project to use the data fields and RPN rating scales specified in the 2009 revision of the SAE J1739 guidelines for Design FMEA (DFMEA).

- Now click the **Configurable Settings** tab. This page provides one way that you can view (and edit) the configurable settings that have been copied into the current project from the predefined DFMEA profile. (Note that the settings are also accessible when you are working in the project by choosing **Project > Management > Configurable Settings** or by clicking any of the **Configurable Settings** icons.)
- As an example, click the **View/Edit Settings** icon for **Severity Scale**.





You can see that the project has been configured to use the 10-point ratings from the SAE J1739 guidelines for Design FMEAs.

Edit Severity Scale (Project: Design FMEA - Automotive Driveshaft Component (J1739))

Ratings Headers

Show sub-severities criteria

Value	Cost/Severity if Detected	Cost/Severity if Undetected	Description	Criteria 1
1	0	0	No Effect	No discernible effect.
2	0	0	Annoyance	Appearance or Audible Noise, vehicle operable, item does not conform. Defect noticed by discriminating customers (< 25%).
3	0	0	Annoyance	Appearance or Audible Noise, vehicle operable, item does not conform. Defect noticed by many customers (50%).
4	0	0	Annoyance	Appearance or Audible Noise, vehicle operable, item does not conform. Defect noticed by most customers (> 75%).
5	0	0	Degradation of Secondary Function	Degradation of secondary function (vehicle operable, but comfort / convenience functions at reduced level of performance).
6	0	0	Loss of Secondary Function	Loss of secondary function (vehicle operable, but comfort / convenience functions inoperable).
7	0	0	Degradation of Primary Function	Degradation of primary function (vehicle operable, but at reduced level of performance).
8	0	0	Loss of Primary Function	Loss of primary function (vehicle inoperable, does not affect safe vehicle operation).
9	0	0	Safety and/or Regulatory Compliance	Potential failure mode affects safe vehicle operation and/or involves noncompliance with government regulation with warning.
10	0	0	Safety and/or Regulatory Compliance	Potential failure mode affects safe vehicle operation and/or involves noncompliance with government regulation without warning.

Copy Existing   OK Cancel

Delete Row

Updating severity scale for this project

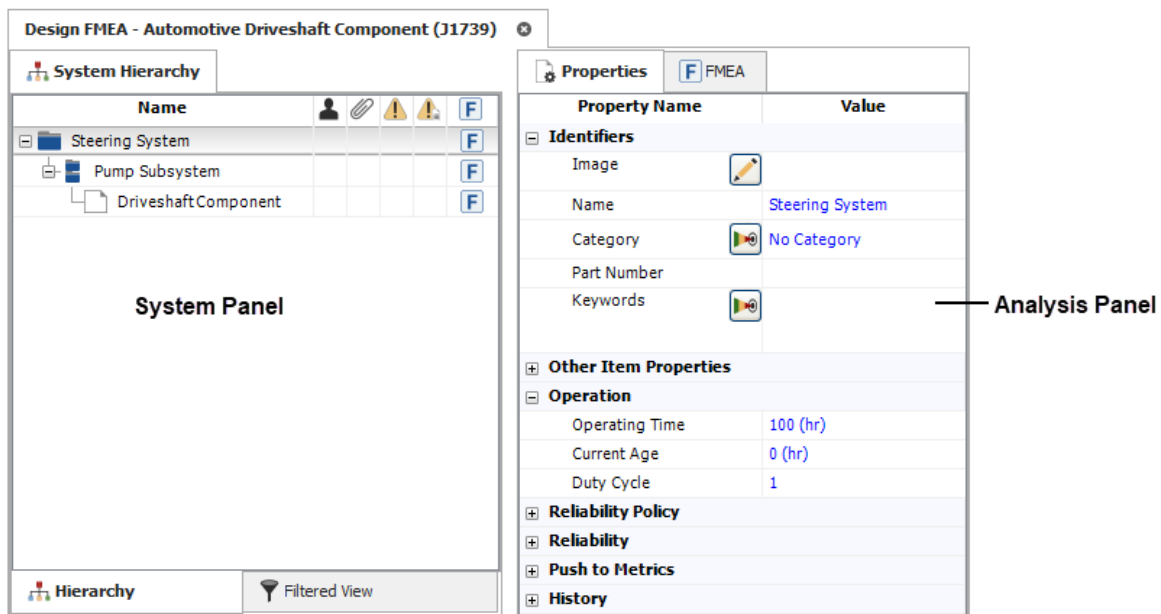
- Click **Cancel** to close the rating scale window without saving any changes.
- If desired, you can click the other **View/Edit Settings** icons to see the rest of the configurable settings that have been predefined for this project. When you are finished exploring these settings, click **Cancel** to close the Project Properties window without saving any changes.

Open a Project

- With the Design FMEA - Automotive Driveshaft Component (J1739) project still selected in the Project Manager, open the project either by double-clicking the project name or by choosing **Project > Management > Open Project**.



The Project window is the main window that you will use to perform your analyses. It is divided into two panels, as shown next.



(If not all of the properties shown in this image are visible on your computer, you can show them by clearing the **Hide reliability nodes on item properties** option on the Settings page of the Application Setup window.)

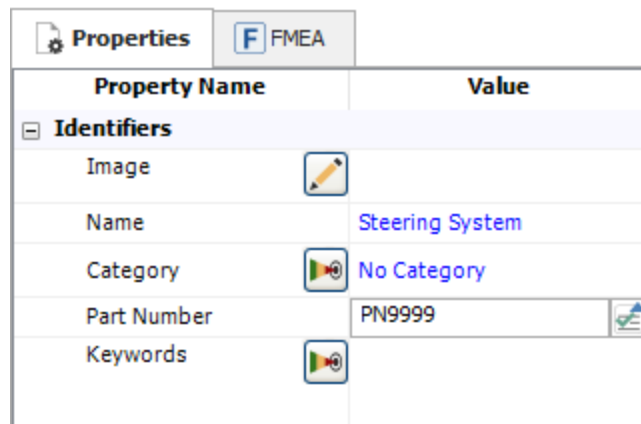
The System panel displays the system hierarchy, which includes all items that have been defined in the project. The Analysis panel displays information and analyses associated with the item that is currently selected in the hierarchy. Depending on your preferences, these panels can be displayed side-by-side, or with one panel above the other.




View the Item Properties

The Properties tab in the Analysis panel displays the item properties fields that are enabled for the current project, along with some settings that can be used for reliability calculations (if desired) and information about when the item record was created and last updated.

You can click inside any field with blue text to edit it. Fields shown in italics cannot be edited, either because they are populated by the application or because they are based on inputs that you make elsewhere in the software.

- If the item properties are not already displayed, click the **Properties** tab at the top of the Analysis panel.
- As an example, click inside the **Part Number** field and type **PN9999**, as shown next.



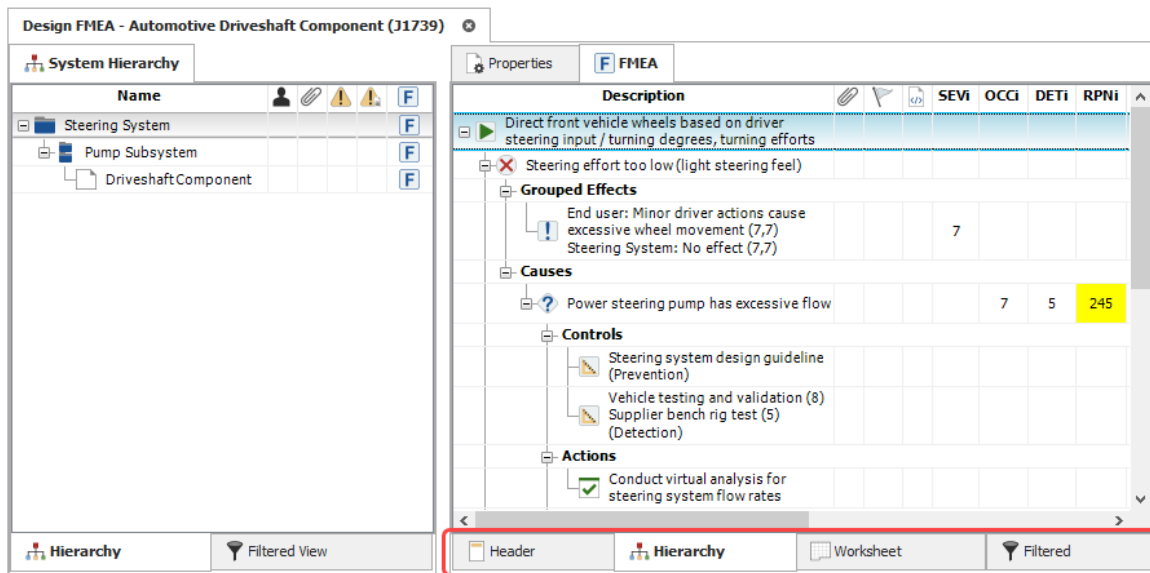
Property Name	Value
Identifiers	
Image	
Name	Steering System
Category	 No Category
Part Number	PN9999 
Keywords	

- If desired, you can edit any of the other item properties. When you are finished exploring these properties, proceed to the next section.

View the FMEA

The FMEA tab in the Analysis panel allows you to view/edit the failure modes and effects analysis for the currently selected item.

Click the **FMEA** tab to view the FMEA for the steering system. There are now four tabs at the bottom of the Analysis panel. Each tab displays the analysis information in a different way to facilitate data entry and decision-making.



The Hierarchy View

The hierarchy view displays the analysis records in a hierarchical tree, which tends to be good for viewing a lot of information in a small amount of space. It can be especially useful when copying and pasting data or when scanning the analysis to find a particular section.

- If the hierarchy view is not already displayed, click the **Hierarchy** tab to view it.
- Double-click the "Direct front vehicle wheels..." function record at the top of the tree. The function properties window will appear, as shown next.

Edit Function

Home | Navigate

Add Function
 Add Failure
 Add Effect
 Add Cause
 Add Control
 Add Action

Configurable Settings | Spelling | Attachments | Change Log

Function

Function	Direct front vehicle wheels based on driver steering input / turning degrees, turning efforts
Name	*
Keywords	

Associated Records

Item	Steering System
------	-----------------

History

Created By	
Date Created	3/9/2010 5:51 PM
Last Updated By	
Last Updated	12/7/2011 3:37 PM

Function

OK | Cancel

Editing function properties

- With the properties window still open, click the first failure ("Steering effort too low...") in the FMEA hierarchy. You can see that the window updates automatically to display the properties for the record that is currently selected.
- If desired, you can continue clicking different records in the hierarchy to view their properties. When you are finished exploring, click **Cancel** to close the properties window without saving any changes.
- Now create a new branch in the hierarchy by right-clicking the "Direct front vehicle wheels..." function and choosing **Add Function** from the shortcut menu.



- In the properties window, type "New Function" in the **Function** field and then click the **Add Failure** icon at the top of the window.



- The properties window is now prepared to define a new failure. In the **Potential Failure Mode** field, type "New Failure" and then click the **Add Effect** icon.

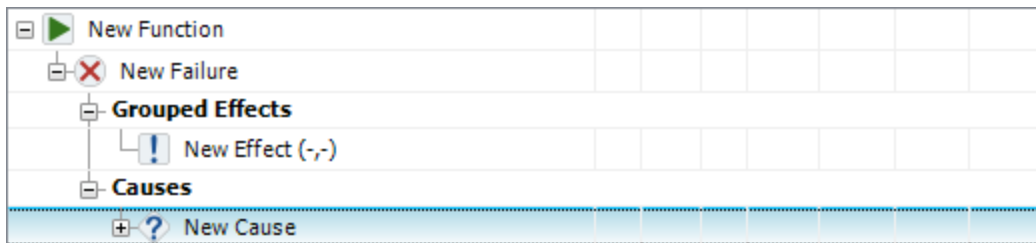


- Now you can define a new effect. In the first **Grouped Effect(s) Properties** field, type "New Effect" and then click the **Add Cause** icon.



- Now you can define a new cause. In the **Potential Cause(s) of Failure** field, type "New Cause" and then click **OK** to close the properties window.

You can see that there is a new branch at the bottom of the hierarchy with the new records you just created.



The Worksheet View

The worksheet view provides an alternative way to view/edit the same analysis information displayed in the hierarchy view. This view allows you to type directly into the worksheet cells and tab through the analysis as you would in a spreadsheet application such as Microsoft Excel®.

- To give more space in the Analysis panel before switching to the worksheet view, choose **View > Workspace Layout > Hide System Panel**.



- Now click the **Worksheet** tab at the bottom of the Analysis panel.

Design FMEA - Automotive Driveshaft Component (J1739)

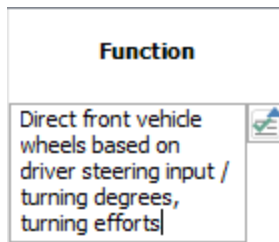
Properties FMEA

	Function	Potential Failure Mode	Potential Effect(s) of Failure	SEVi	Classification	Potential Cause(s) of Failure	OCCi	Current Design Controls (Prevention)
1	Direct front vehicle wheels based on driver steering input / turning degrees, turning efforts	Steering effort too low (light steering feel)	End user: Minor driver actions cause excessive wheel movement (7,7) Steering System: No effect (7,7)	7		Power steering pump has excessive flow	7	Steering system design guideline
2		Steering efforts too high (periods of difficult steering or pump catch)	Steering System: No effect (7,7) End User: Driver has difficulty turning or parking (7,7)	7		Power steering pump inadequate flow	7	Steering system design guideline
3	New Function	New Failure	New Effect (-,-)			New Cause		

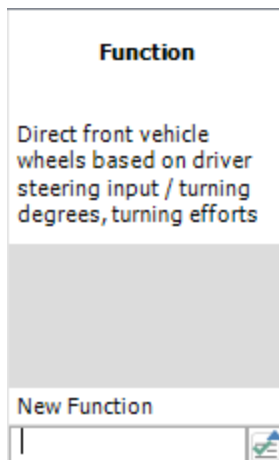
Function 0 Attachments

Header Hierarchy Worksheet Filtered

- Double-click inside the first function description. You can see that the cell switches from "select mode" (with a blue background) to "edit mode" (with a white background and a blinking cursor so you can modify the text).



- Press **ENTER**. Note that the blinking cursor now appears in the second function description. Press **ENTER** again and the application will automatically create a new row so that you can type a new function description at the bottom of the worksheet, as shown next.



- This time, instead of typing the function description, you can use the Select Existing utility to reuse text that is already stored in the database. While the cell is in "edit mode," click the **Select Existing** icon.



- In the Select Existing window, look at the Project Filter, Item Filter, Record Filter and Phrase Sets drop-down lists. These lists allow you to specify the source(s) for the list of existing descriptions that you can select from.
- Look in the list of descriptions and double-click any existing description from the list. This automatically enters the selected text into the worksheet cell. This convenient feature is available for text fields throughout the application.
- Now scroll all the way to the right side of the worksheet so that you can see the revised ratings columns. Change the revised occurrence rating (OCCr) for the first cause by double-clicking inside the corresponding cell. Choose **3** from the drop-down list, as shown next.

Design FMEA - Automotive Driveshaft Component (J1739)

Properties | FMEA

DETI	RPNi	Recommended Actions	Responsibility	Planned Completion Date	Actions Taken	Actual Completion Date	SEVr	OCCr	DETr	RPNr	
1	5	245	Conduct virtual analysis for steering system flow rates	HBM Prensca	1/20/2020	Virtual analysis completed; confirmed flow rates within operating parameters is acceptable, ref file no. Va2380, Jan 2020.	1/20/2020	7	2	2	28
2	5	245	Conduct virtual analysis for steering system minimum flow capability	HBM Prensca	1/20/2020	Virtual analysis completed; confirmed flow rates within operating parameters is acceptable, ref file no. Va2380, Jan 2020.	1/20/2020	7	2	2	28
3											
4											

Cause | 0 Attachments

Header | Hierarchy | Worksheet | Filtered

Value	Description
1	Very Low
2	Low
3	Low
4	Moderate

- To exit "edit mode" for this field, press **ALT** or click somewhere else in the worksheet to accept this change. Notice that the revised RPN (RPNr) has been recalculated automatically and has changed from 28 to 42.
- If desired, you can continue to explore the worksheet view by adding and editing records. When you are finished, proceed to the next section.

The Filtered View

The filtered view allows you to generate sortable lists of different types of records. For example, you can view a list of all causes in the analysis, all actions sorted by due date, etc.

- Click the **Filtered** tab at the bottom of the Analysis panel.
- From the **Filter By** drop-down list at the upper right corner, choose **Causes**. The Analysis panel will change to display all of the causes that have been defined in the current analysis (sorted in alphabetical order by default).

	Potential Cause(s) of Failure	Classification	OCCi	DETi	RPNi	OCCr	DETr	RPNr
1	? New Cause							
2	? Power steering pump has excessive flow		7	5	245	2	2	28
3	? Power steering pump inadequate flow		7	5	245	3	2	42

- You can sort the records by clicking any of the column headers. You can also double-click any record to open its Properties window.
- If desired, you can continue to explore the filtered view by changing the filter or sorting by different columns. When you are finished, proceed to the next section.

Header for Report Output




In addition to the three complementary views of the analysis information, a fourth tab in the Analysis panel allows you to view and edit the information that will be displayed at the top of FMEA spreadsheet reports. This includes information such as the document number, the name of the person who created the report, the revision date, etc.

- Click the **Header** tab to view the details that have been entered for the steering system FMEA.
- If desired, you can change any of the properties displayed in blue text. When you are finished, proceed to the next section.

Priority Highlights

The optional Priority Highlights feature allows you to apply colored backgrounds to identify each failure mode as high, medium or low priority based on its RPN, severity, occurrence and/or detection rating. The priority ranges and colors can be set via the Interface Style option on the Configurable Settings tab in the Project Properties window.

- To see the settings that have been defined for the current project, choose **Project > Management > Configurable Settings > Interface Style**. The settings are displayed at the bottom of the FMEA > RPNs page. For this project, the priorities are based simply on RPN and are configured as follows:

Highlight Priority Based On		
RPN	High Priority >=	300
	Low Priority <=	30
Select Highlight Colors		
High Priority	Medium Priority	Low Priority
		

- To see the highlights in the steering system FMEA, first click the **Hierarchy** tab again then choose **View > Workspace Layout > Split Panels**.



Now the system hierarchy is displayed again on the left, and the FMEA hierarchy is displayed on the right.

- Choose **FMEA > Tools > Highlight Priority** several times to toggle the background colors on and off for the RPNi and RPNr columns.



- When you are finished exploring this feature, proceed to the next section.

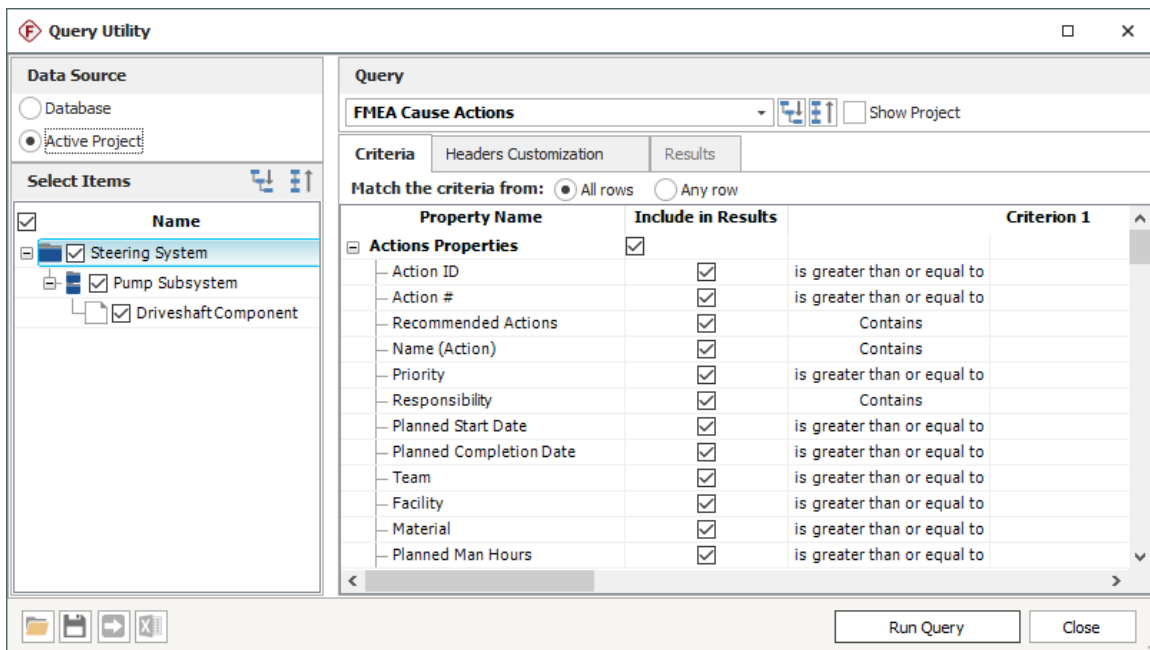
User-Defined Queries

The Query utility allows you to search the current project or the current database for the analysis records that meet your specific query criteria. The results of the queries are returned in tabular grids that can then be exported to Microsoft Excel or incorporated into any of the print-ready reports that you generate from the software.

- To access the Query utility, choose **Home > Reporting > Queries**.



- The left side of the window allows you to specify which analysis data will be considered in the query. For this example, select **Active Project** to consider data from the current project only. Then select all of the items in the current project so the utility will query all three FMEAs in this project.
- In the Query area on the right side of the window, choose **FMEA Cause Actions** from the drop-down list.

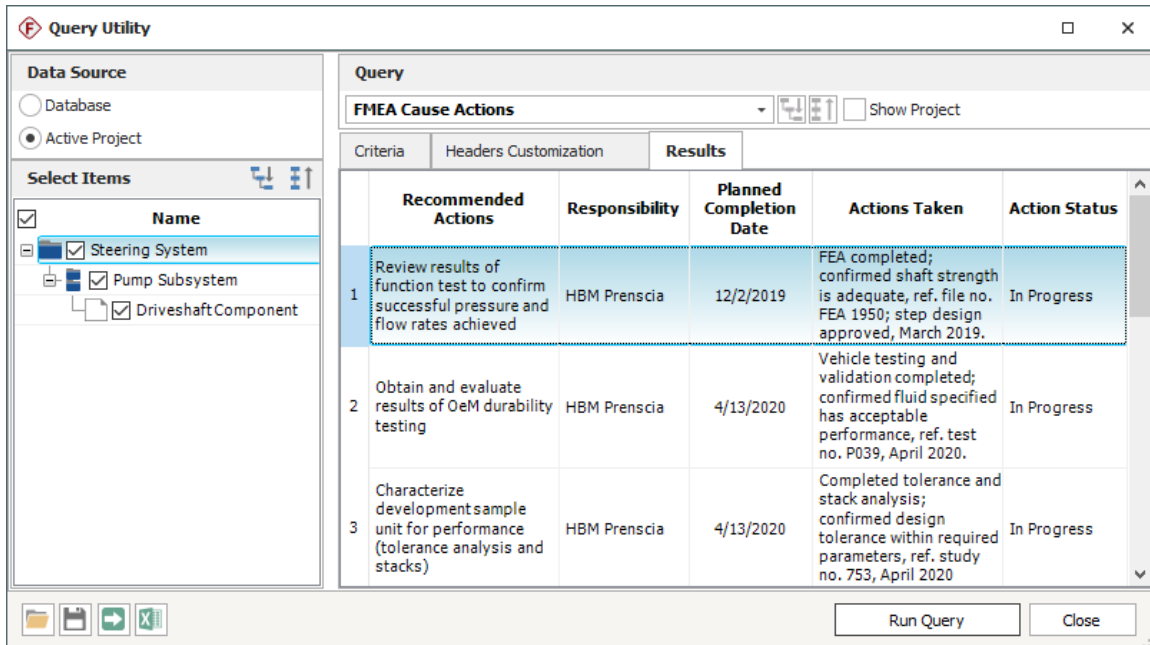


- You can then specify which columns you want to appear in the query results. For this example, clear the check box at the top of the Include in Results column, then select the individual check boxes for the following properties:

- **Recommended Actions**
 - **Responsibility**
 - **Planned Completion Date**
 - **Actions Taken**
 - **Action Status**
- For Actual Completion Date, specify that only actions that have not yet been completed will be included in the query results by choosing **is empty** in the first of the Criterion 1 columns. Even though this field will not be displayed in the results, it can still be used to filter the analysis records.

Property Name	Include in Results	
Actual Completion Date	<input type="checkbox"/>	is greater than or equal
Action Status	<input checked="" type="checkbox"/>	equals
Expected Start Date	<input type="checkbox"/>	is greater than
Expected Completion Date	<input type="checkbox"/>	is greater than or equal to
Percent Completed	<input type="checkbox"/>	is less than
Specification/Methodology	<input type="checkbox"/>	is less than or equal to
Plan/Procedure	<input type="checkbox"/>	does not equal
Specification Notes/Remarks	<input type="checkbox"/>	is empty
Requirements	<input type="checkbox"/>	is not empty
Criteria	<input type="checkbox"/>	
Sample Size	<input type="checkbox"/>	contains

- Click **Run Query**. The query results will appear in the Results tab, as shown next.



The screenshot shows the 'Query Utility' window with the following data:

	Recommended Actions	Responsibility	Planned Completion Date	Actions Taken	Action Status
1	Review results of function test to confirm successful pressure and flow rates achieved	HBM Prencsia	12/2/2019	FEA completed; confirmed shaft strength is adequate, ref. file no. FEA 1950; step design approved, March 2019.	In Progress
2	Obtain and evaluate results of OEM durability testing	HBM Prencsia	4/13/2020	Vehicle testing and validation completed; confirmed fluid specified has acceptable performance, ref. test no. P039, April 2020.	In Progress
3	Characterize development sample unit for performance (tolerance analysis and stacks)	HBM Prencsia	4/13/2020	Completed tolerance and stack analysis; confirmed design tolerance within required parameters, ref. study no. 753, April 2020	In Progress

You can click any column header to sort the results by that column. You also can double-click any record to open it. If desired, you can also click the **Send to Excel** icon to send the query results to a spreadsheet in Microsoft Excel.



For this example, we will save the query as a template that can be applied to any data set. This saved query will also be included in the report that you will generate in the next step.

- Click the **Save Query** icon.



- Type **Incomplete Actions** for the query name, then click **OK**.
- Close the Query utility and proceed to the next step.

Generate a Report of the Analysis

XFMEA provides a complete set of reports for your analysis. Reports can be generated in Microsoft Word® and/or Excel, which provides maximum flexibility for customization and the ability to create HTML and/or PDF versions of the reports.

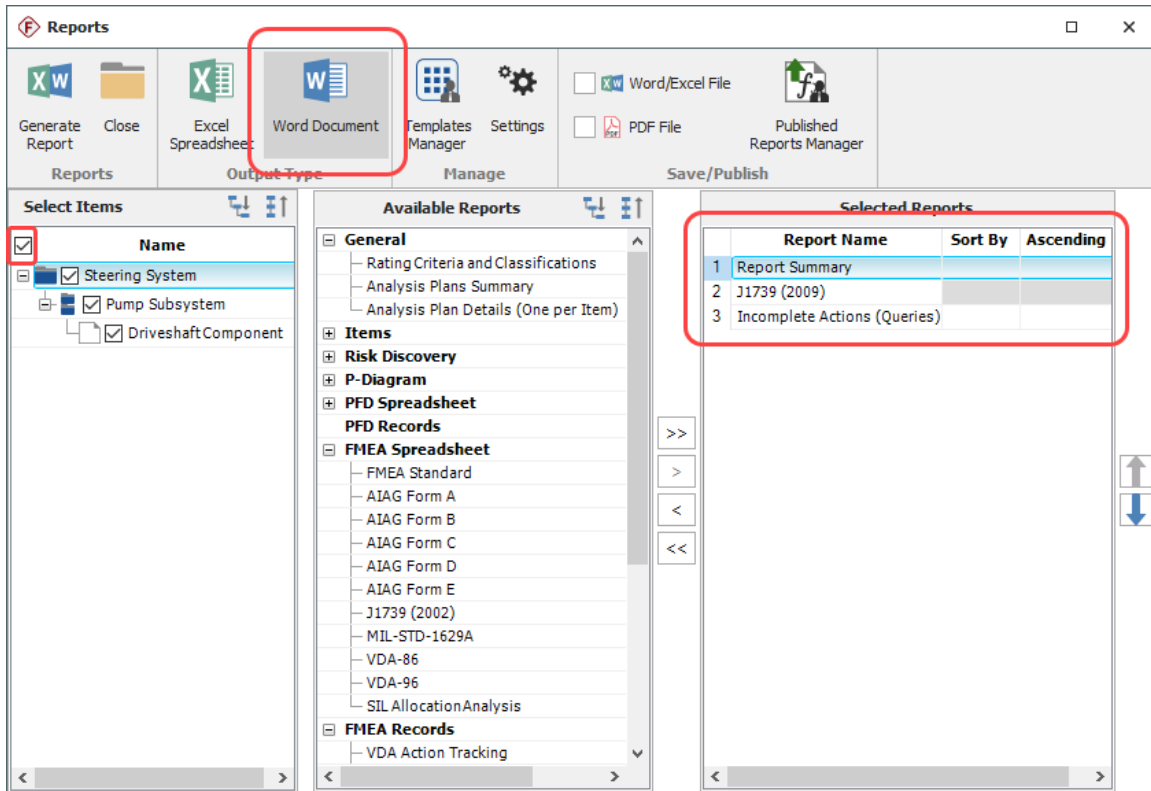
- To open the Reports window, choose **Home > Reporting > Reports**.



- The Select Items area (on the left) allows you to specify the item(s) from the system hierarchy that will be included in the report. Make sure that all three items are selected.
- The Available Reports area (in the middle) displays the report forms that are available to be included in the report document, while the Selected Reports area (on the right) displays the report forms that will be included in the new report you are generating now. Click the **Exclude All** icon (<<) to clear the Selected Reports area so you can start building the new report from scratch.
- In the Available Reports area, press **CTRL** and click each of the following report forms so they are all selected at the same time.
 - Under the General heading, select **Report Summary**.
 - Under the FMEA Spreadsheet heading, select **J1739 (2009)**.
 - Under the FMEA Records heading, select **Incomplete Actions (Queries)**.
- Click the **Select** (>) icon to move all three of these report forms into the Selected Reports area.

Tip: You can also drag and drop or double-click the report form names to move them back and forth between "available" and "selected."

- Finally, select to generate the report as a **Word Document**. The Reports window will look like the one shown next.



- Click **Generate Report** and specify a name and location for the document. When you click **Save**, a progress bar will appear. After the report is complete, it will open automatically in Microsoft Word.
- When you have finished viewing the report, leave it open and return to XFMEA, then close the Reports window.

Generate Charts Based on the Analysis

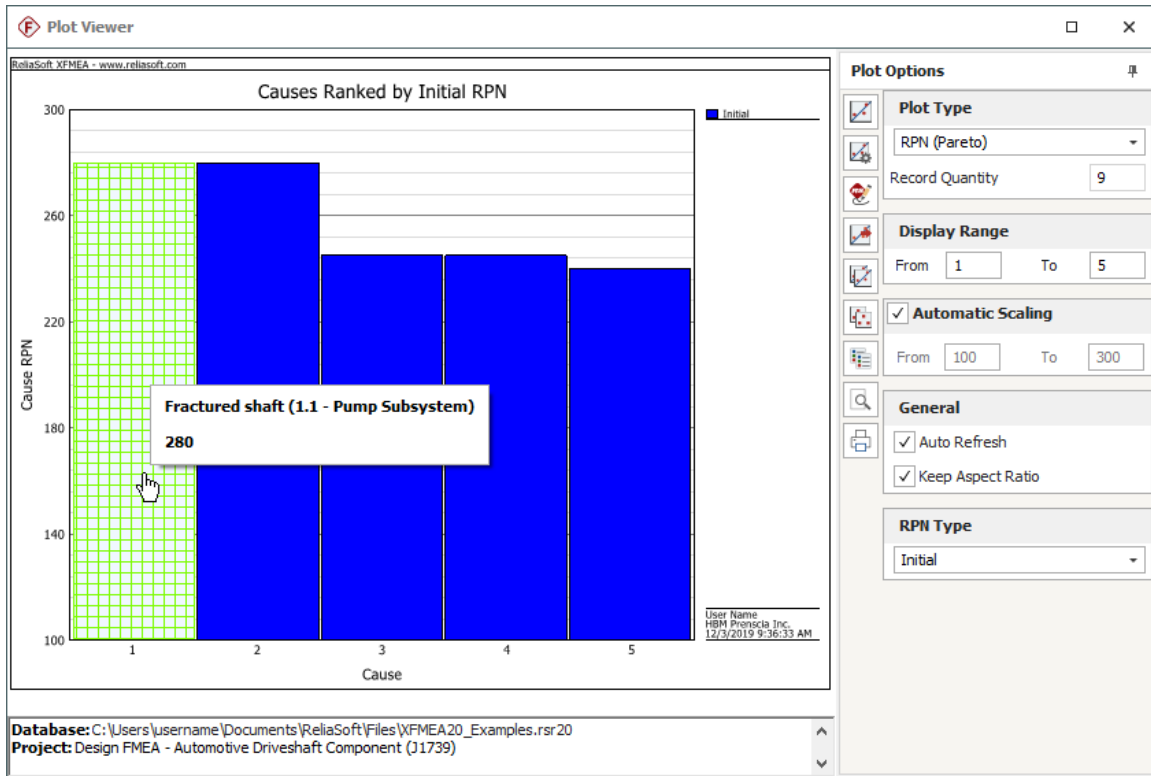
XFMEA also provides a complete array of plots and charts for graphical presentation of your analysis.

To create graphical charts, choose **Home > Reporting > Plots**.



- In the Select Items window that appears, select to include the data associated with all three items in the project, then click **OK**.
- Choose **RPN (Pareto)** from the **Plot Type** drop-down list, then make the following selections:
 - **Display Range** = 1 to 5
 - **Automatic Scaling** = Selected
 - **Auto Refresh** = Selected
 - **Keep Aspect Ratio** = Selected
 - **RPN Type** = Initial

The Plot Viewer will look like the one shown next. You can point to each bar to see the failure mode it represents.



- Drag the horizontal splitter bar to see the Plot Summary, which shows the details associated with the current chart.

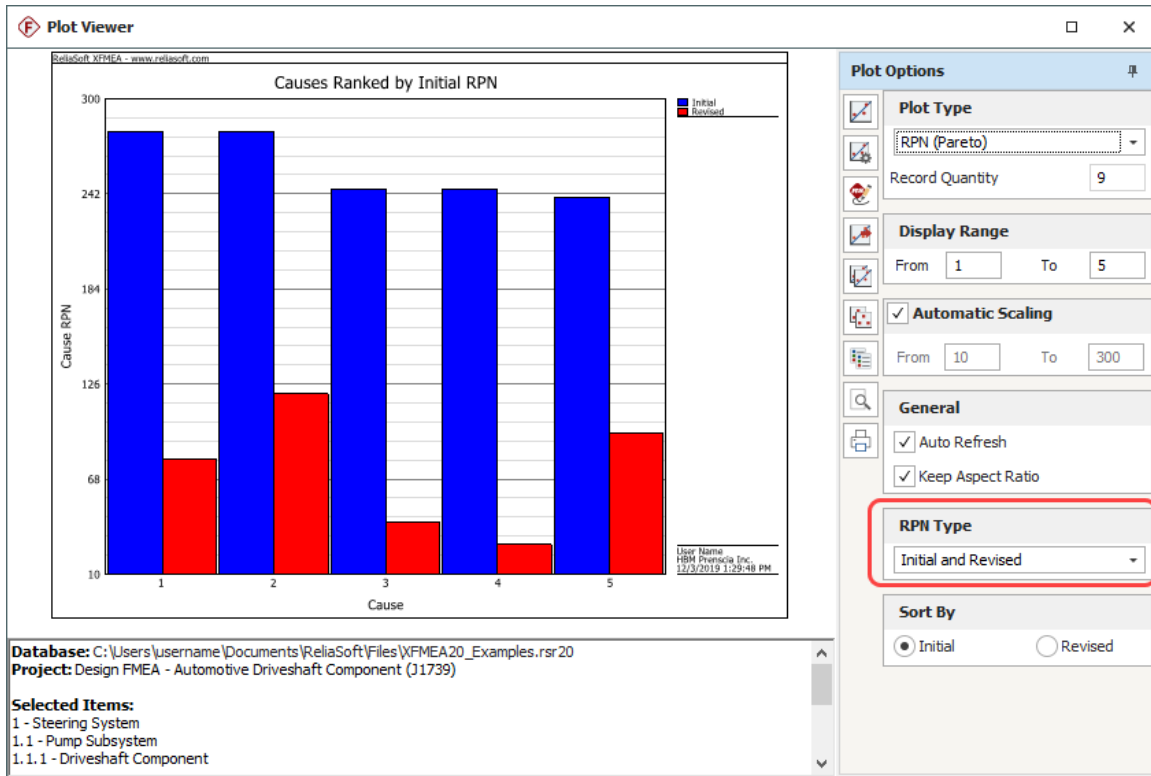
Database: C:\Users\username\Documents\ReliaSoft\Files\XFMEA20_Examples.rsr20
Project: Design FMEA - Automotive Driveshaft Component (J1739)

Selected Items:
1 - Steering System
1.1 - Pump Subsystem
1.1.1 - Driveshaft Component

Causes Ranked by Initial RPN (1 - 5)
1: RPNi = 280 - Fractured shaft (Item: 1.1 - Pump Subsystem)
2: RPNi = 280 - Pressure relief incorrectly specified on drawing (Item: 1.1 - Pump Subsystem)

- Next, select **Initial and Revised** from the **RPN Type** drop-down list. If the **Auto Refresh** option is selected, the display will update automatically. If not, click **Redraw Plot**.





Copy Plot Graphic and Summary

- To add the plot to your Word document, first click the **Copy Plot Graphic** icon on the control panel.



- Go to the report that you created in Microsoft Word and paste the graphic into the document.
- Now return to XFMEA's Plot Viewer. This time, click the **Copy Plot Summary** icon.



- Return to the Word document, place the cursor below the chart graphic and paste the contents of the Clipboard into the report.
- Save the changes you have made to the report and close Microsoft Word, then close the Plot Viewer.

Close the Database

Congratulations! You have completed the First Steps Example for XFMEA.

- To close the sample database, choose **File > Close Database**.



Note that if you do not close the database, it will be closed automatically when you create or open a new one.