4WD Loader Tutorial (eTemplate)

Edition Note

This document describes the release information of **RecurDyn V9R4**.

Table of Contents

Chapter

1

Precautions

1. In this tutorial, Header Type and Parameter Definition are distinguished by color when inputting Excel data in the sheet, and **colors have no effect on the data.**

2. When using eTemplate in this tutorial, **open a New Model to start the next eTemplate** before opening an eTemplate.

3. This tutorial is designed so that users can copy and use Excel data every chapter. Copy the area with the left sign onto the sheet.

Prerequisites

Before starting this tutorial, follow the ProcessNet 4WD Loader Tutorial (VSTA) of RecurDyn Tutorial first.

Overview

In this tutorial, you will learn how to:

▪ Create a set of contacts automatically using eTemplate.

▪ Make the modeling process more effective and accurate using eTemplate.

▪ Use S4PARK Technology based on Excel, not on the coding.

Task Objective

In this tutorial, you will learn how to simulate a pair of hoses in the 4WD Loader. The hoses are linked to the hydraulic pump at the rear of the vehicle to the cylinder of the frontal Loader linkage, and the Loader is steers by articulation. The hoses bend as the two sections of the frame articulate and may contact each other.
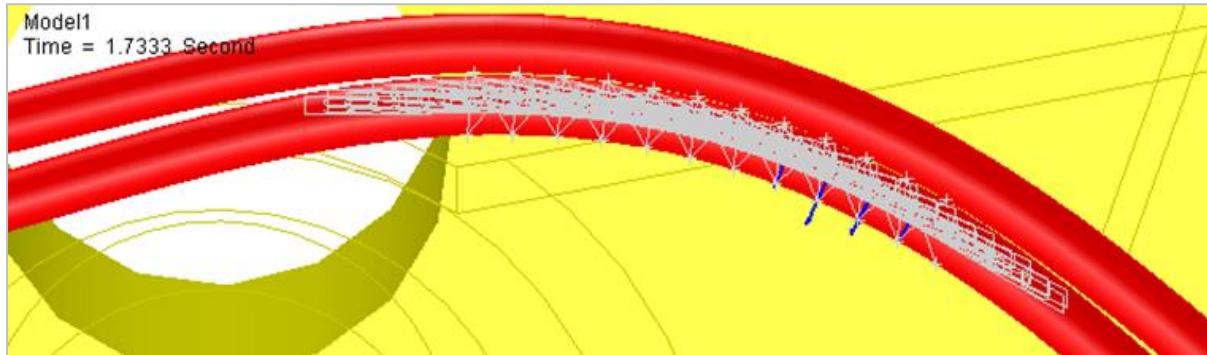
It is important to understand contacts to predict any binding or wear problem. In addition, as it is hard to estimate actual motions of the hoses and the location of contacts, any contact between the segments of the two hoses as shown in the figure below needs to be defined to figure out where the contact happens and how much contact force applies in the simulation. This may **become boring and cause many errors** due to a number of repeated operations. Using eTemplate, however, can make the modeling process **more effective and accurate**. Whereas **ProcessNet** requires such a complicated process of coding, you can use **eTemplate by inputting simple basic data in Excel**.

Chapter

2

Opening the 4WD Hydraulic Hose Model

In this section, you will learn how to import and setup a model to use eTemplate.

Estimated Time to Complete

10 minutes

Starting RecurDyn

To start RecurDyn and open recent models:

1. On the Desktop, double-click the **RecurDyn** icon.

2. Close the Start RecurDyn dialog box, as Recent Models, not a New Model, need to be used.

3. From the **File** menu, click **Open**.

4. From the eTempalte tutorial directory (<Install Dir> \Help\Tutorial\eTemplate\Tut1_4WD_Loader), select the **4WD_Loader_Start.rdyn file**.

5. Click **Open**.

Then you will see the following model.
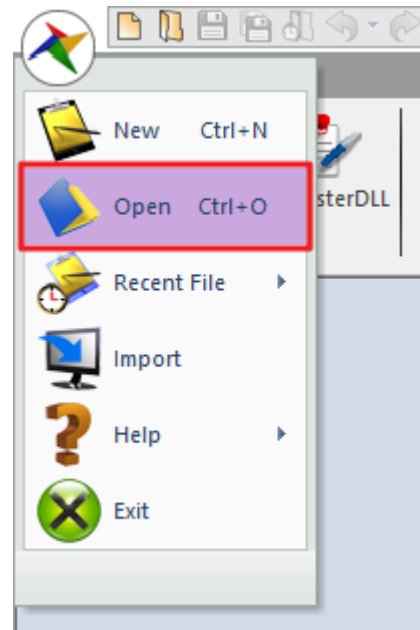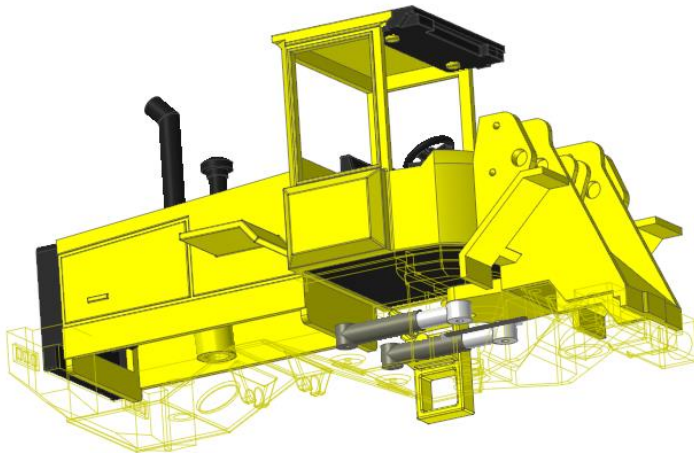
The red line means the hydraulic hose to learn about in this tutorial.

Tip: The hoses appear as above by selecting the View mode (Render Each Object) as they look dim at the bottom of the vehicle. (If it is hard to see the hoses, check if the current mode is the Shaded view mode is and change the mode to Render Each Object view mode.)

To save the initial model:

1. From the **File** menu, click **Save As**.

2. Save the model different directory, because you cannot simulation in tutorial directory.

To Change the Model Layer Number:

1. Change Layer Number of bodies except for the hydraulic hoses so that the hydraulic hoses can be seen easily.

2. Activate the Bodies group of Database.

3. Click **CabMain** Body and click **Steer_Cyl_OD_L** Body with the **Shift Key**.

4. Right-click and select Property.

5. From the General tab, change Layer Number to **2**.
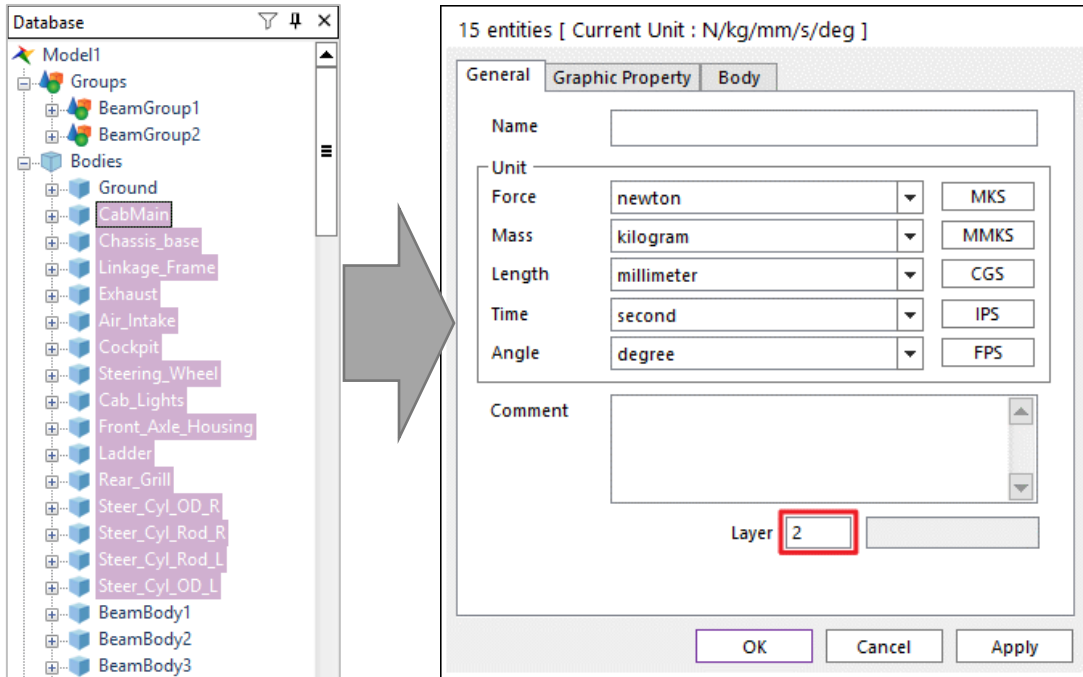
6. Click **OK**.

7. Click **Layer Settings** icon.

   Layer Settings Dialog appear. Check the **Show User-Defined Layer** to filter the defined layers.

8. Check **1st Layer** only and set the brief names.

9. Close **Layer Settings Dialog**.

   Only the hydraulic hoses appear on the working window.
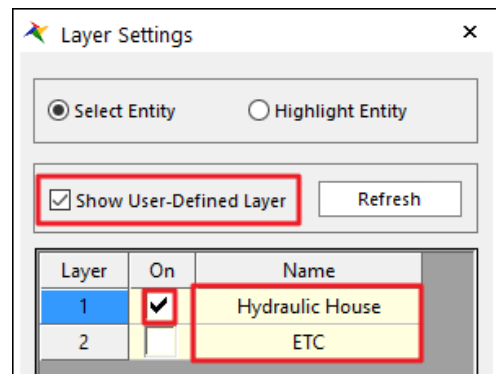
Dyn/Kin

10. From the **Simulation Type** group in the **Analysis** tab, click the **Dyn/Kin** icon and perform an analysis.

11. Check the result.

   The hydraulic hoses change as shown below. In the below figure, the hydraulic hoses contact with each other in the center. So, in Chapter 3, you will learn how to make the hydraulic hoses contact with each other using Solid Contact.
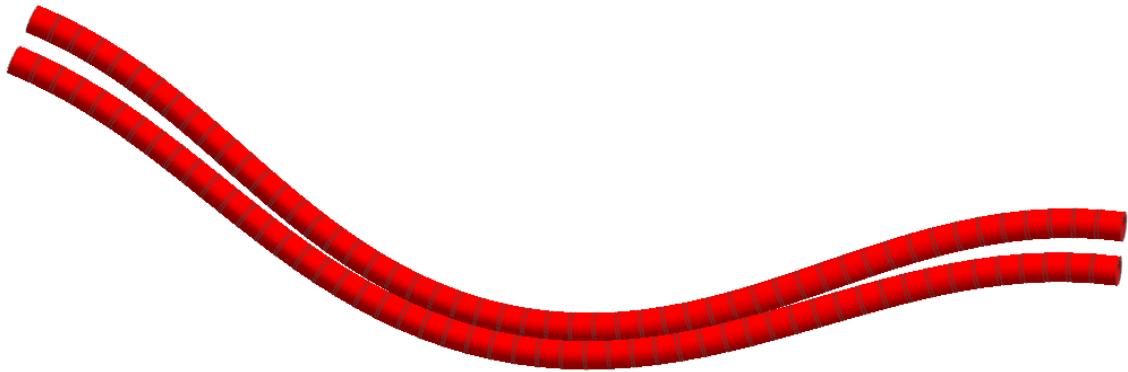
Defining the Auto Contact

Task Objective

You will learn how to create eTemplate that creates contact between segments of the hydraulic hoses.

- Collect information to create the **RecurDyn** entity.
- Use **Solid Contact** in **RecurDyn**.
- Modify the Solid Contact parameters.

After performing a simulation, you will learn how to re-create contact for better results.

Estimated Time to Complete

35minutes

Understanding the Contacts to be Created

In Chapter 1, we have explained two hoses with 50 segments as shown in the following figure. Loader and Frame of hoses are connected at both ends, and the central rotation axis of Loader applies between both ends. When articulation occurs one hose tends to be stretched more and the other hose stretched less. Since contacts happen in the center of the hoses due to their different curves, create contact in the center.
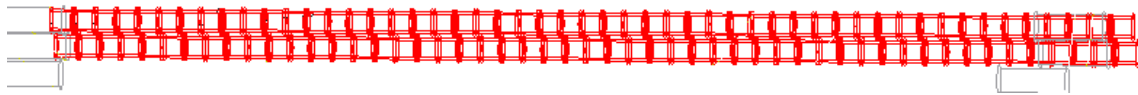
With eTemplate, 11 contacts will be created in the center of the hoses as shown below. Whereas ProcessNet requires a complicated process of coding, you can use eTemplate by inputting simple basic data in Excel.
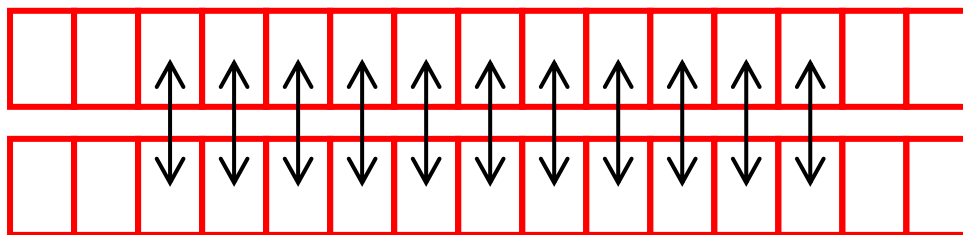
Creating the Solid Contact

To collect information to create the RecurDyn entity:

1. Examine the hydraulic hose body to add Solid Contact.

2. The hydraulic hoses consist of **BeamGroup1** and **BeamGroup2**.

3. BeamGroup1 has 51 bodies from **BeamBody1** to **BeamBody51**.

4. BeamGroup2 has 51 bodies from **BeamBody52** to **BeamBody102**.

5. Think about how BeamGroup1 and BeamGroup2 contact with each other.

6. BeamGruop1 uses from **BeamBody20** to **BeamBody31**, and BeamGruop2 uses from **BeamBody71** to **BeamBody82**.

7. Change colors to make it easier to find each BeamBody in the BeamGroup.

8. From the Database, left click BeamBody to select all.

9. Click the Working window and right-click **BeamBody20** to select BeamBody20 only, and a window to select Property will appear.

10. Select Property, move to the Graphic Property tab, and change the color to yellow.

11. Repeat steps 8 through 10 for **BeamBody30**, **BeamBody71**, and **BeamBody82**.
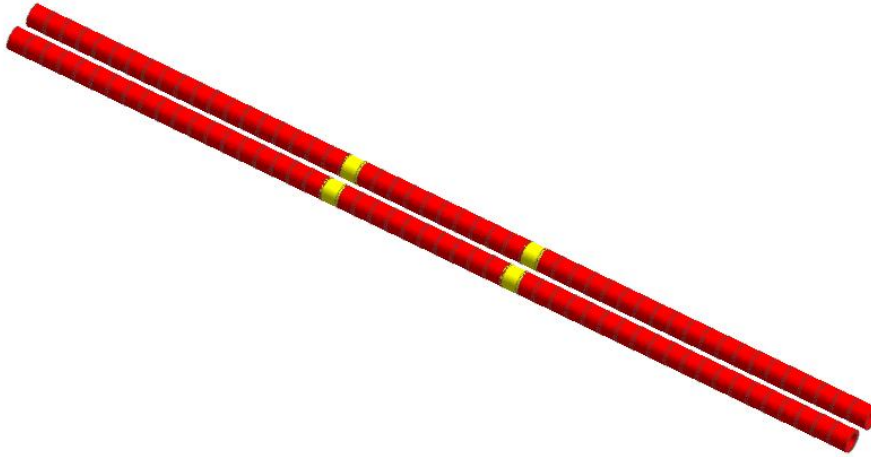
12. From the **Contact** group in the **Professional** tab, click the **Solid** icon.

13. Make sure that **Solid, Solid** Creation Method Option is selected and click both **BeamBody20** and **BeamBody71**.

14. Check the created Solid Contact Property.

15. Check that Base Geometry is **BeamBody20.HollowCircularBeam1** and Action Geometry is **BeamBody71.HollowCircularBeam1**.

16. When completing eTemplate, input the name of the body and geometry in the definition of the contact.

17. Before creating eTemplate, delete **SolidContact1** created above.

Defining the Template Sheet

To define the Template_Format Sheet:

Define the template to be used in Modification Mode.

1. Open **Excel** and then create a sheet called **Template_Format**.

    Template_Format Sheet is a sheet that defines how to process the template data.

2. In the **Template_Format** sheet, enter the **header** and **parameter** information that defines the template format.

	A	B	C	D	E	F
1	Template_Format_Definition	Value				
2	Modulekey	S4PARK_Module_Professional				
3	TemplateMode	FreeStyleMode				
4	UserCommentColumn	0				
5						
6						
7						

Template_Format | Template_Data

Template_Format_Definition	Value
ModuleKey	S4PARK_Module_professional
TemplateMode	FreeStyleMode
UsercommentColumn	0

- ModuleKey: Select a RecurDyn product module.

- TemplateMode: Select a parameter arrangement method.

- UserCommentColumn: Enter a value between 1 and 5 to use one of the columns between A and E in the sheet. If you don't want to use a column, enter 0.

Tip: Copying the header and parameters using the eTemplate Helper
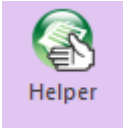
Helper

1. **On the Customize** tab, in the **eTemplate** group, click the **Helper** icon to run the **eTemplate Helper**.

2. **Click the Template Setting** button

3. **Copy the header** and **parameters** of the **Template_Format** sheet to the template.

4. Edit the **values** so that they fit the tutorial.

   You may also need to add additional headers and parameters as you continue with this tutorial.

   Or, you can copy the headers and parameters from the completed template file provided by RecurDyn.
   (**Template File path**:

   <Install Dir> \Help\Tutorial\eTemplate\Tut1_4WD_Loader\4WD_Loader_Template.xlsx)

To define the Template_Data Sheet:

You must configure the **Template_Data** sheet in order to enter the values used in **Creation Mode**.

1. Create a sheet called **Template_Data**.

2. In the **Template_Data** sheet, enter the **headers** and **parameters** in order to create the **Solid Contact**.
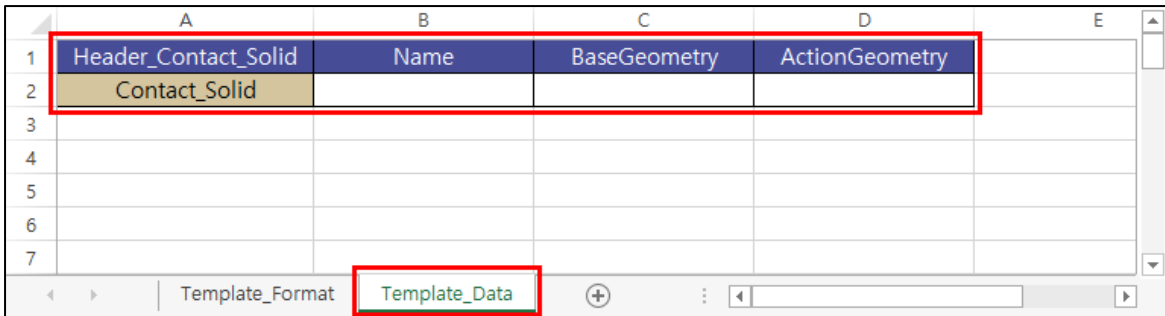
For the **Solid Contact,** enter the following values:

Header_Contact_Solid	Name	BaseGeometry	ActionGeometry
Contact_Solid			

- **Name**: Name of solid contact.
- **BaseGeometry**: Name of the base geometry of solid contact
- **ActionGeometry**: Name of the action geometry of solid contact

3. Enter the name one by one from **SolidContact1** to **SolidContact11**.

4. Based on the information collected earlier, input from **BeamBody20.HollowCircularBeam1** to **BeamBody30.HollowCircularBeam1** as the body of BeamGroup1 in Base Geometry. Note that **HollowCircularBeam**, geometry contained in each body needs to be entered as well.

5. Based on the information collected earlier, input from **BeamBody71.HollowCircularBeam1** to **BeamBody81.HollowCircularBeam1** as the body of BeamGroup2 in Action Geometry.

Header_Contact_Solid	Name	BaseGeometry	ActionGeometry
Contact_Solid	SolidContact1	BeamBody20.HollowCircularBeam1	BeamBody71.HollowCircularBeam1
Contact_Solid	SolidContact2	BeamBody21.HollowCircularBeam1	BeamBody72.HollowCircularBeam1
Contact_Solid	SolidContact3	BeamBody22.HollowCircularBeam1	BeamBody73.HollowCircularBeam1
Contact_Solid	SolidContact4	BeamBody23.HollowCircularBeam1	BeamBody74.HollowCircularBeam1
Contact_Solid	SolidContact5	BeamBody24.HollowCircularBeam1	BeamBody75.HollowCircularBeam1
Contact_Solid	SolidContact6	BeamBody25.HollowCircularBeam1	BeamBody76.HollowCircularBeam1
Contact_Solid	SolidContact7	BeamBody26.HollowCircularBeam1	BeamBody77.HollowCircularBeam1
Contact_Solid	SolidContact8	BeamBody27.HollowCircularBeam1	BeamBody78.HollowCircularBeam1
Contact_Solid	SolidContact9	BeamBody28.HollowCircularBeam1	BeamBody79.HollowCircularBeam1
Contact_Solid	SolidContact10	BeamBody29.HollowCircularBeam1	BeamBody80.HollowCircularBeam1
Contact_Solid	SolidContact11	BeamBody30.HollowCircularBeam1	BeamBody81.HollowCircularBeam1

6. If the Solid Contact is created as above, **parameters** are created as default values of RecurDyn. However, basic **stiffness** and **damping** values for the Solid Contact are too high. So, in order to lower the values, create an option to set two **Contact Parameters**.

7. To the Contact of eTemplate, add the **ContactProperty** option to change stiffness and damping among other characteristic values.

8. First of all, to define values to be input in ContactProperty, set stiffness and damping in the name of **ContactProperty_Info**

Header_Info_ContactProperty	Name	DampingCoefficient	StiffnessCoefficient
Info_ContactProperty	ContactProperty_Info	0.1	1000

9. Input **ContactProperty_Info** as defined above in the **ContactProperty** option of Solid Contact onto the right of **ActionGeometry**.

10. After performing a simulation, add the option to view **Force Display** as well.
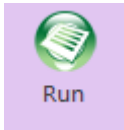
ContactProperty	ForceDisplay
ContactProperty_Info	Action
ContactProperty_Info	Action
ContactProperty_Info	Action
ContactProperty_Info	Action
ContactProperty_Info	Action
ContactProperty_Info	Action
ContactProperty_Info	Action
ContactProperty_Info	Action
ContactProperty_Info	Action
ContactProperty_Info	Action
ContactProperty_Info	Action

11. eTemplate appears as shown in the figure below.

	A	B	C	D	E	F
1	Header_Contact_Solid	Name	BaseGeometry	ActionGeometry	ContactProperty	ForceDisplay
2	Contact_Solid	SolidContact1	BeamBody20.HollowCircularBeam1	BeamBody71.HollowCircularBeam1	ContactProperty_Info	Action
3	Contact_Solid	SolidContact2	BeamBody21.HollowCircularBeam1	BeamBody72.HollowCircularBeam1	ContactProperty_Info	Action
4	Contact_Solid	SolidContact3	BeamBody22.HollowCircularBeam1	BeamBody73.HollowCircularBeam1	ContactProperty_Info	Action
5	Contact_Solid	SolidContact4	BeamBody23.HollowCircularBeam1	BeamBody74.HollowCircularBeam1	ContactProperty_Info	Action
6	Contact_Solid	SolidContact5	BeamBody24.HollowCircularBeam1	BeamBody75.HollowCircularBeam1	ContactProperty_Info	Action
7	Contact_Solid	SolidContact6	BeamBody25.HollowCircularBeam1	BeamBody76.HollowCircularBeam1	ContactProperty_Info	Action
8	Contact_Solid	SolidContact7	BeamBody26.HollowCircularBeam1	BeamBody77.HollowCircularBeam1	ContactProperty_Info	Action
9	Contact_Solid	SolidContact8	BeamBody27.HollowCircularBeam1	BeamBody78.HollowCircularBeam1	ContactProperty_Info	Action
10	Contact_Solid	SolidContact9	BeamBody28.HollowCircularBeam1	BeamBody79.HollowCircularBeam1	ContactProperty_Info	Action
11	Contact_Solid	SolidContact10	BeamBody29.HollowCircularBeam1	BeamBody80.HollowCircularBeam1	ContactProperty_Info	Action
12	Contact_Solid	SolidContact11	BeamBody30.HollowCircularBeam1	BeamBody81.HollowCircularBeam1	ContactProperty_Info	Action
13						
14	Header_Info_ContactProperty	Name	DampingCoefficient	StiffnessCoefficient		
15	Info_ContactProperty	ContactProperty_Info	0.1	1000		

Template_Format Template_Data

12. **Save** the created **eTemplate**.

To run the eTemplate:

Run

1. From **eTemplate** group in the **Customize** tab, click the **Run** icon.
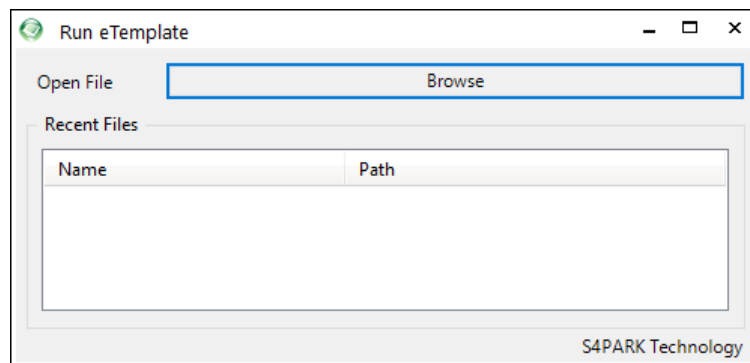
2. Click **Browse** and **Import** the created eTemplate file.
3. The Loaded Successfully message pops up.
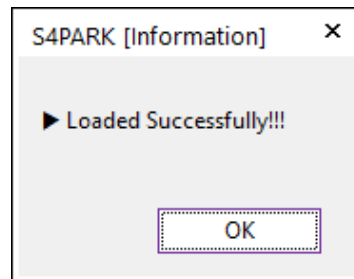
A **contact model** is created as below.
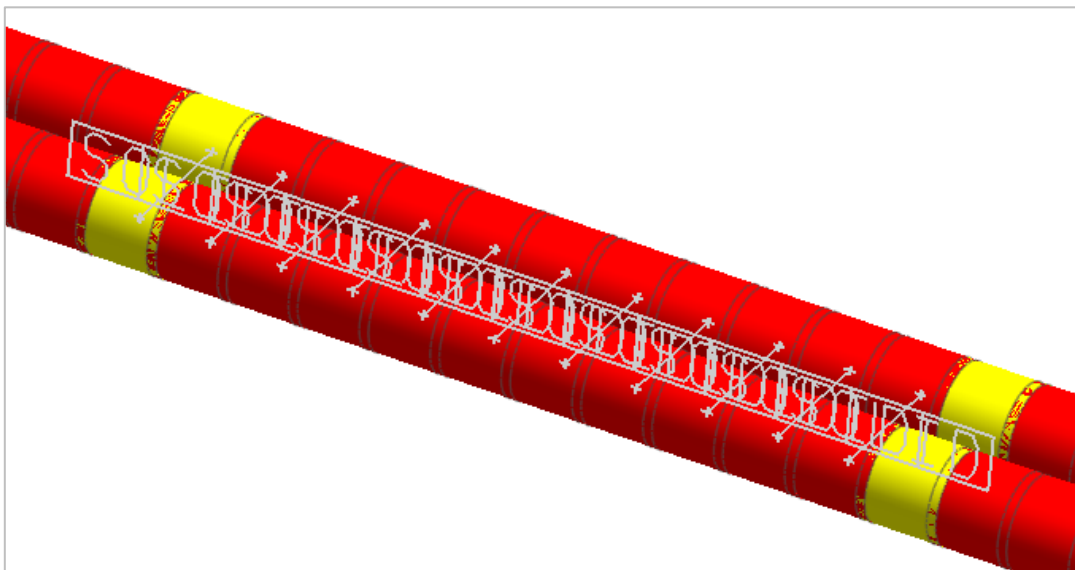
Performing a Simulation

To perform a simulation:

1. From the **Simulation Type** group in the **Analysis** tab, click the **Dyn/Kin**.

2. To perform a simulation, set **End Time** to **2.0**, **Step** to **300**, and **Plot Multiplier Step Factor** to 5, respectively.

3. Click **Simulate**. The simulation may last **5 – 10** minutes, depending on the speed of the computer.
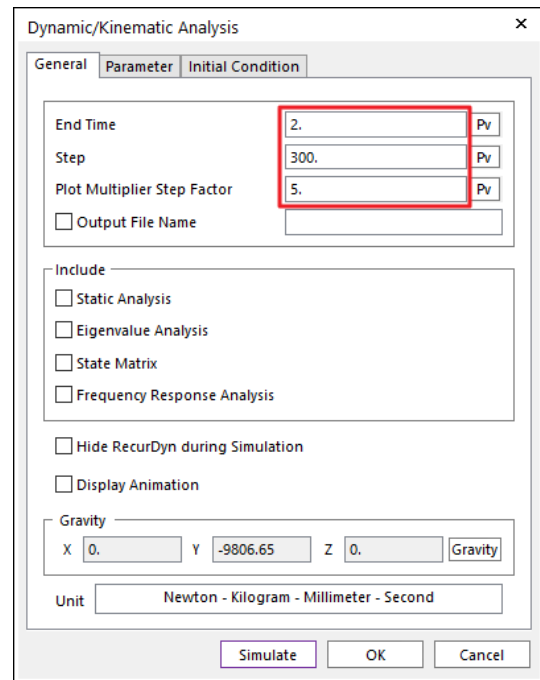
Viewing the Result

To view the result:

1. From the **Animation Control** group in the **Analysis** tab, click the **Play** icon.

2. At the end of the simulation, the hoses appear as in the figure below.

3. At the end of the simulation, **Force seems like a bit irregular**. Observing their motions shows that they are slipping away from each other.

4. This is because of failed contact between relevant segments, and to solve this problem, setting the contact between the neighboring **Segments** is necessary.

The next chapter shows how to set the contact at adjacent segments.
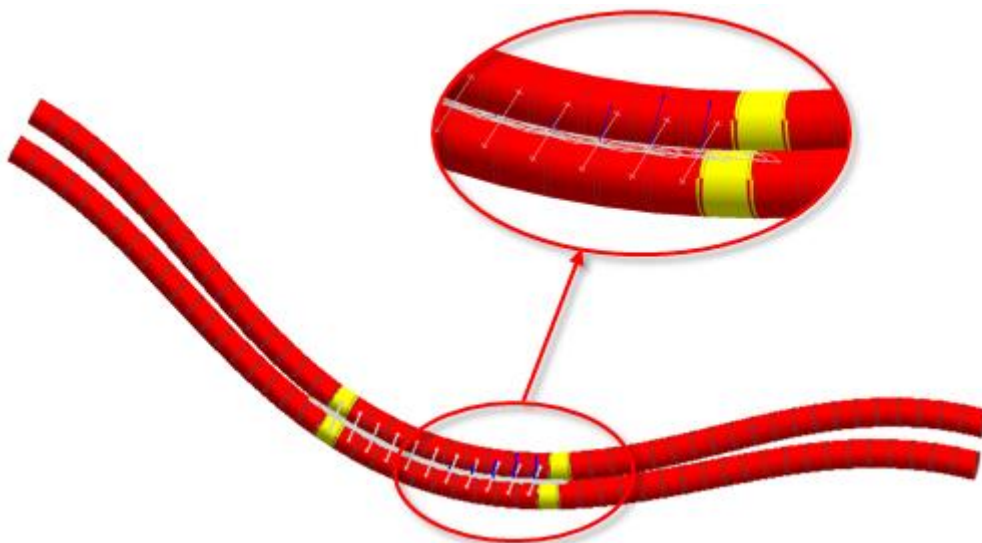
Chapter

4

Defining Segment Contact

Task Objective

Failed contact between segments can cause a trouble, and to solve this problem, setting the contact between the neighboring segments is necessary.

- Modify the eTemplate data.
- Set Segment Contact using Solid Contact.

After performing a simulation, you will see better results.

Estimated Time to Complete

15 minutes

Defining Segment Contact

Failed contact between segments can cause a trouble, and to solve this problem, setting the contact between the neighboring segments is necessary. This phenomenon appears as in the following figure.
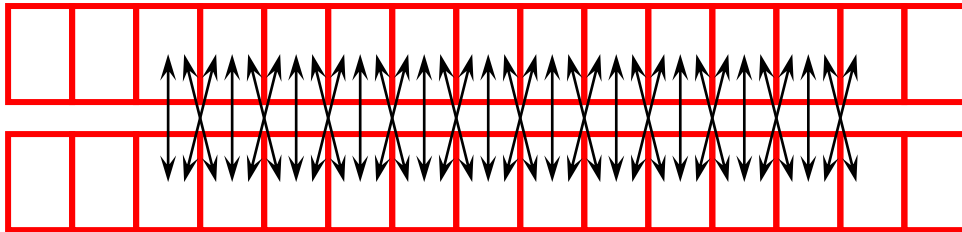
To delete the eTemplate Solid Contact:

1. Before creating an additional Solid Contact, delete the contact created in Chapter 3.

2. When importing eTemplate, it is impossible to create if there is an entity with the same name.

3. From the Database window, select the first solid contact, **SolidContact1**.

4. Pressing the Shift key, select the last solid contact, **SolidContact11**.

5. Press the **Delete** key.
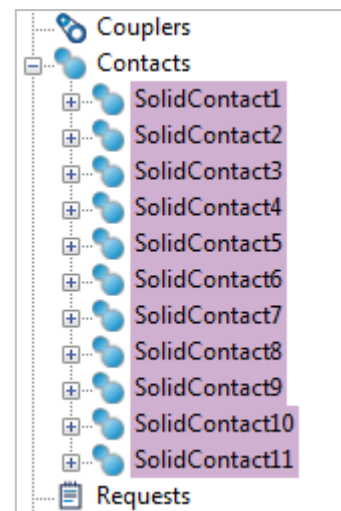
To create additional eTemplate Solid Contact:

1. Open eTemplate created in Chapter 3 and create two types of additional Contact Groups.

2. First of all, set the name of the contact created between the **i+1 th segment** of Hydraulic Hose **1** and the **j th segment** of Hydraulic Hose 2 by adding "a."

3. From the information collected earlier, input from **BeamBody21.HollowCircularBeam1** to **BeamBody31.HollowCircularBeam1** as the body of BeamGroup1 in the **Base Geometry**.

4. From the information collected earlier, input from **BeamBody71.HollowCircularBeam1** to **BeamBody81.HollowCircularBeam1** as the body of BeamGroup2 in the **Action Geometry**.

5. Using the definition of eTemplate of Solid Contact, input as below.

Header_Contact_Solid	Name	BaseGeometry	ActionGeometry	ContactProperty	ForceDisplay
Contact_Solid	SolidContact1a	BeamBody21.HollowCircularBeam1	BeamBody71.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact2a	BeamBody22.HollowCircularBeam1	BeamBody72.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact3a	BeamBody23.HollowCircularBeam1	BeamBody73.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact4a	BeamBody24.HollowCircularBeam1	BeamBody74.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact5a	BeamBody25.HollowCircularBeam1	BeamBody75.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact6a	BeamBody26.HollowCircularBeam1	BeamBody76.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact7a	BeamBody27.HollowCircularBeam1	BeamBody77.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact8a	BeamBody28.HollowCircularBeam1	BeamBody78.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact9a	BeamBody29.HollowCircularBeam1	BeamBody79.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact10a	BeamBody30.HollowCircularBeam1	BeamBody80.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact11a	BeamBody31.HollowCircularBeam1	BeamBody81.HollowCircularBeam1	ContactProperty_Info	Action

6. Secondly, set the name of the contact created between the **ith segment** of Hydraulic Hose 1 and the **j+1th segment** of Hydraulic Hose 2 by adding "b"

7. From the information collected earlier, input from **BeamBody20.HollowCircularBeam1** to **BeamBody30.HollowCircularBeam1** as the body of BeamGroup1 in the **Base Geometry**.

8. From the information collected earlier, input from **BeamBody72.HollowCircularBeam1** to **BeamBody82.HollowCircularBeam1** as the body of BeamGroup2 in the **Action Geometry**.

9. Using the definition of eTemplate of Solid Contact, input as below.

Header_Contact_Solid	Name	BaseGeometry	ActionGeometry	ContactProperty	ForceDisplay
Contact_Solid	SolidContact1b	BeamBody20.HollowCircularBeam1	BeamBody72.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact2b	BeamBody21.HollowCircularBeam1	BeamBody73.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact3b	BeamBody22.HollowCircularBeam1	BeamBody74.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact4b	BeamBody23.HollowCircularBeam1	BeamBody75.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact5b	BeamBody24.HollowCircularBeam1	BeamBody76.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact6b	BeamBody25.HollowCircularBeam1	BeamBody77.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact7b	BeamBody26.HollowCircularBeam1	BeamBody78.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact8b	BeamBody27.HollowCircularBeam1	BeamBody79.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact9b	BeamBody28.HollowCircularBeam1	BeamBody80.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact10b	BeamBody29.HollowCircularBeam1	BeamBody81.HollowCircularBeam1	ContactProperty_Info	Action
Contact_Solid	SolidContact11b	BeamBody30.HollowCircularBeam1	BeamBody82.HollowCircularBeam1	ContactProperty_Info	Action

10. Input **ContactProperty_Info** as defined in Chapter 3 in the **ContactProperty** option of the Solid Contact on the right of **ActionGeometry**.

11. After performing a simulation, add the option to view **Force Display** as well at Force.

12. Upon completion of input, **Template_Data Sheet** appears as below.

	A	B	C	D	E	F
1	Header_Contact_Solid	Name	BaseGeometry	ActionGeometry	ContactProperty	ForceDisplay
2	Contact_Solid	SolidContact1	BeamBody20.HollowCircularBeam1	BeamBody71.HollowCircularBeam1	ContactProperty_Info	Action
3	Contact_Solid	SolidContact2	BeamBody21.HollowCircularBeam1	BeamBody72.HollowCircularBeam1	ContactProperty_Info	Action
4	Contact_Solid	SolidContact3	BeamBody22.HollowCircularBeam1	BeamBody73.HollowCircularBeam1	ContactProperty_Info	Action
5	Contact_Solid	SolidContact4	BeamBody23.HollowCircularBeam1	BeamBody74.HollowCircularBeam1	ContactProperty_Info	Action
6	Contact_Solid	SolidContact5	BeamBody24.HollowCircularBeam1	BeamBody75.HollowCircularBeam1	ContactProperty_Info	Action
7	Contact_Solid	SolidContact6	BeamBody25.HollowCircularBeam1	BeamBody76.HollowCircularBeam1	ContactProperty_Info	Action
8	Contact_Solid	SolidContact7	BeamBody26.HollowCircularBeam1	BeamBody77.HollowCircularBeam1	ContactProperty_Info	Action
9	Contact_Solid	SolidContact8	BeamBody27.HollowCircularBeam1	BeamBody78.HollowCircularBeam1	ContactProperty_Info	Action
10	Contact_Solid	SolidContact9	BeamBody28.HollowCircularBeam1	BeamBody79.HollowCircularBeam1	ContactProperty_Info	Action
11	Contact_Solid	SolidContact10	BeamBody29.HollowCircularBeam1	BeamBody80.HollowCircularBeam1	ContactProperty_Info	Action
12	Contact_Solid	SolidContact11	BeamBody30.HollowCircularBeam1	BeamBody81.HollowCircularBeam1	ContactProperty_Info	Action
13						
14	Header_Info_ContactProperty	Name	DampingCoefficient	StiffnessCoefficient		
15	Info_ContactProperty	ContactProperty_Info	0.1	1000		
16						
17	Header_Contact_Solid	Name	BaseGeometry	ActionGeometry	ContactProperty	ForceDisplay
18	Contact_Solid	SolidContact1a	BeamBody21.HollowCircularBeam1	BeamBody71.HollowCircularBeam1	ContactProperty_Info	Action
19	Contact_Solid	SolidContact2a	BeamBody22.HollowCircularBeam1	BeamBody72.HollowCircularBeam1	ContactProperty_Info	Action
20	Contact_Solid	SolidContact3a	BeamBody23.HollowCircularBeam1	BeamBody73.HollowCircularBeam1	ContactProperty_Info	Action
21	Contact_Solid	SolidContact4a	BeamBody24.HollowCircularBeam1	BeamBody74.HollowCircularBeam1	ContactProperty_Info	Action
22	Contact_Solid	SolidContact5a	BeamBody25.HollowCircularBeam1	BeamBody75.HollowCircularBeam1	ContactProperty_Info	Action
23	Contact_Solid	SolidContact6a	BeamBody26.HollowCircularBeam1	BeamBody76.HollowCircularBeam1	ContactProperty_Info	Action
24	Contact_Solid	SolidContact7a	BeamBody27.HollowCircularBeam1	BeamBody77.HollowCircularBeam1	ContactProperty_Info	Action
25	Contact_Solid	SolidContact8a	BeamBody28.HollowCircularBeam1	BeamBody78.HollowCircularBeam1	ContactProperty_Info	Action
26	Contact_Solid	SolidContact9a	BeamBody29.HollowCircularBeam1	BeamBody79.HollowCircularBeam1	ContactProperty_Info	Action
27	Contact_Solid	SolidContact10a	BeamBody30.HollowCircularBeam1	BeamBody80.HollowCircularBeam1	ContactProperty_Info	Action
28	Contact_Solid	SolidContact11a	BeamBody31.HollowCircularBeam1	BeamBody81.HollowCircularBeam1	ContactProperty_Info	Action
29						
30	Header_Contact_Solid	Name	BaseGeometry	ActionGeometry	ContactProperty	ForceDisplay
31	Contact_Solid	SolidContact1b	BeamBody20.HollowCircularBeam1	BeamBody72.HollowCircularBeam1	ContactProperty_Info	Action
32	Contact_Solid	SolidContact2b	BeamBody21.HollowCircularBeam1	BeamBody73.HollowCircularBeam1	ContactProperty_Info	Action
33	Contact_Solid	SolidContact3b	BeamBody22.HollowCircularBeam1	BeamBody74.HollowCircularBeam1	ContactProperty_Info	Action
34	Contact_Solid	SolidContact4b	BeamBody23.HollowCircularBeam1	BeamBody75.HollowCircularBeam1	ContactProperty_Info	Action
35	Contact_Solid	SolidContact5b	BeamBody24.HollowCircularBeam1	BeamBody76.HollowCircularBeam1	ContactProperty_Info	Action
36	Contact_Solid	SolidContact6b	BeamBody25.HollowCircularBeam1	BeamBody77.HollowCircularBeam1	ContactProperty_Info	Action
37	Contact_Solid	SolidContact7b	BeamBody26.HollowCircularBeam1	BeamBody78.HollowCircularBeam1	ContactProperty_Info	Action
38	Contact_Solid	SolidContact8b	BeamBody27.HollowCircularBeam1	BeamBody79.HollowCircularBeam1	ContactProperty_Info	Action
39	Contact_Solid	SolidContact9b	BeamBody28.HollowCircularBeam1	BeamBody80.HollowCircularBeam1	ContactProperty_Info	Action
40	Contact_Solid	SolidContact10b	BeamBody29.HollowCircularBeam1	BeamBody81.HollowCircularBeam1	ContactProperty_Info	Action
41	Contact_Solid	SolidContact11b	BeamBody30.HollowCircularBeam1	BeamBody82.HollowCircularBeam1	ContactProperty_Info	Action
42						
43						

Template_Format   Template_Data   (+)
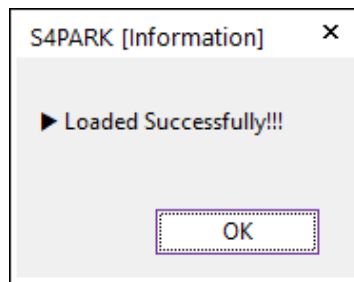
13. **Save** the created **eTemplate.**
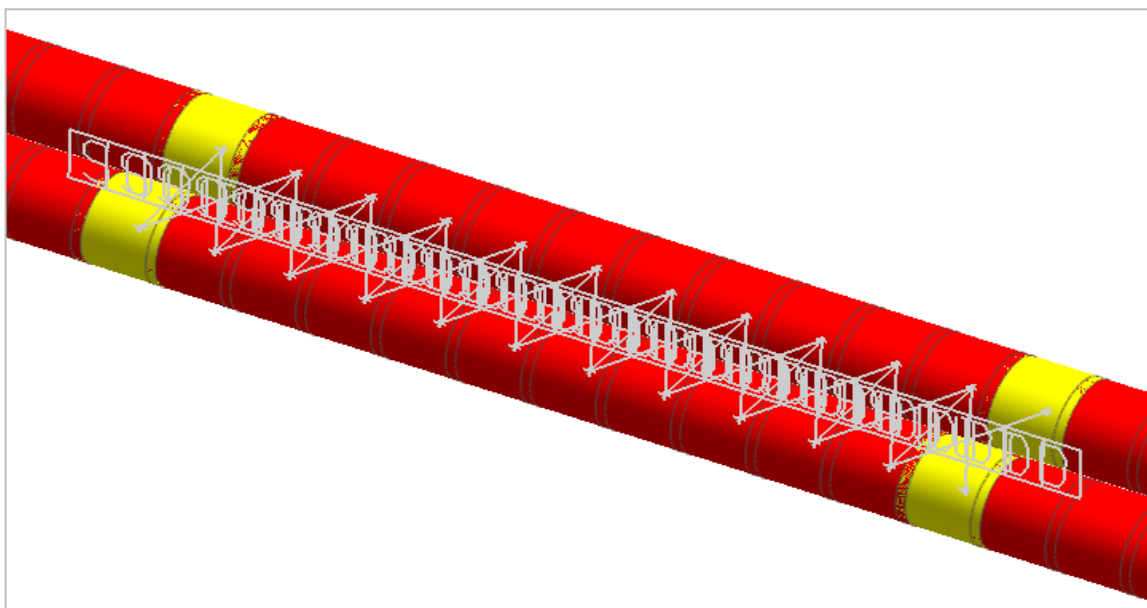
To run the eTemplate:

Run
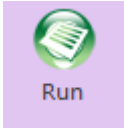
1. From the **eTemplate** group into the **Customize** tab, click **Run** icon.
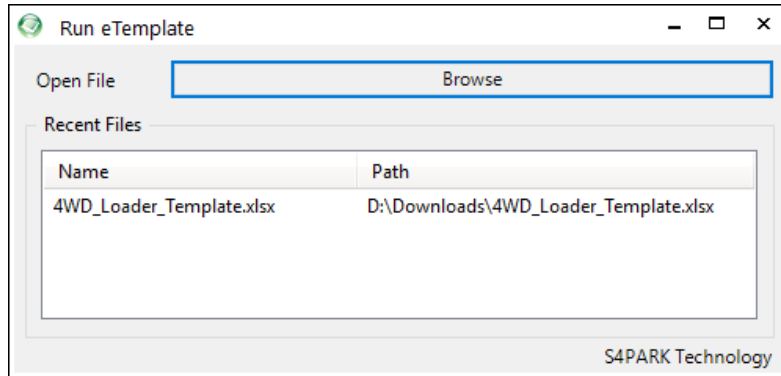
2. The eTemplate record made in Chapter 3 is saved in Recent Files.
3. Double-click the record to import the eTemplate files automatically.
4. The Loaded Successfully message pops up.

The **new contact models** are created as shown in the figure below.

Performing a Simulation

To perform a simulation

1. From the **Simulation Type** group in the **Analysis** tab, click the **Dyn/Kin**.
2. Click **Simulate**.

Viewing the Result

To view the result:

1. From the **Animation Control** group in the **Analysis** tab, click the **Play** icon.
2. At the end of the simulation, the hoses appear deformed as in the following figure.
3. Contact Force looks smoother.
4. Now, you will know how to create complicated contacts using eTemplate.
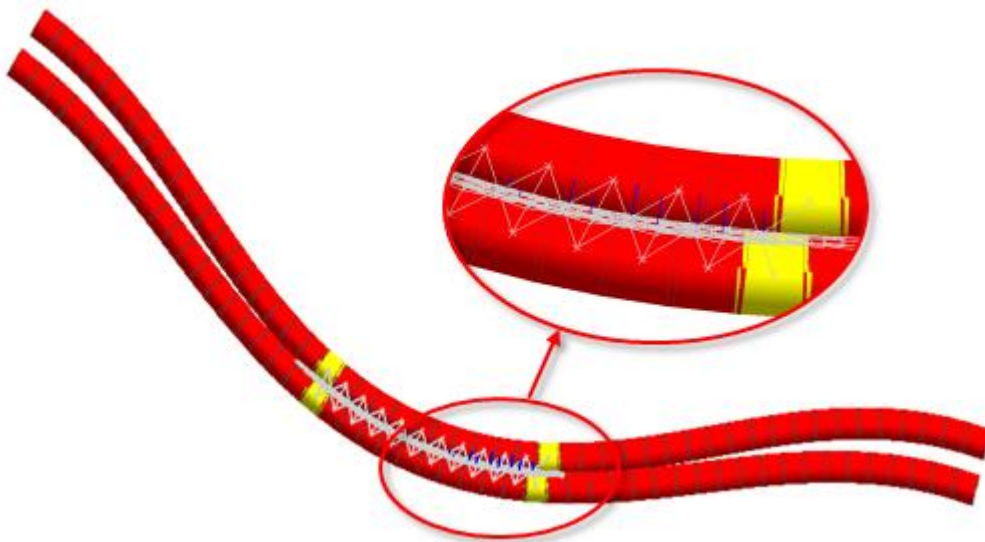
Thanks for participating in this tutorial!