Introduction to Tube and Pipe

This chapter introduces you to the tube and pipe environment in Autodesk® Inventor®. Using the tube and pipe environment, you can create rigid pipe, bent tube, and flexible hose runs between your assembly components.

Objectives

After completing this chapter, you will be able to:

- Describe the tube and pipe environment.
Lesson: Introduction to Tube and Pipe

This lesson describes the tube and pipe environment and the creation of rigid tube, pipe, and flexible hose routes for fluids and gases in a machine assembly.

The tube and pipe environment enables you to easily create and optimize tube, pipe, and hose runs, saving design time and streamlining the process of creating and distributing more accurate models. Typical uses for the environment include routing fluids and gases through mechanical assemblies, and creating project designs using rigid tube, pipe, or flexible hose segments.

The following illustration shows a typical tube and pipe design in which rigid pipe, bent tubing, and flexible hoses are used to route air and oil between components.

Objectives

After completing this lesson, you will be able to:

- Describe the purpose and characteristics of a tube and pipe design.
- Describe how the tube and pipe environment is integrated into Autodesk Inventor.
- Explain the basic steps involved in creating tube and pipe runs.
About Tube and Pipe Designs

Inventor 2010 Tube and Pipe includes features for setting tube and pipe styles, adding runs and routes to mechanical assemblies or product designs, populating selected routes with library components, and adding optional fittings. When a tube and pipe run is complete, the tube and pipe information can be represented in drawings and presentations.

Definition of Tube and Pipe Designs

Pipes, tubing, and hoses are common in a variety of machinery. You use the tube and pipe environment to model rigid pipe, bent tube, and flexible hose runs between assembly components. As your design changes, the runs automatically update to match changes in the positions of related assembly components.

The tube and pipe environment is designed to create pipe, tube, and hose runs for industrial machinery. The tube and pipe environment is not intended for large process piping designs.
Example of a Tube and Pipe Design

In the following illustration, an example of how you can use tube and pipe designs to help finalize your prototype is shown. As you can see, you can use various styles to represent your design.

1. A flexible hose is routed between two components.
2. A rigid pipe design is connected by optional fittings.
3. A bent tube design.

Tube and Pipe Environment

Tools for creating tube and pipe designs are available from the assembly environment on the ribbon through the Tube and Pipe tab and Route tab.

Ribbon Tabs in the Assembly Design

As you switch design tasks and environments, the tabs and panels on the ribbon change accordingly.
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Tube and Pipe Tab

The Tube and Pipe tab is displayed when you create or activate a master runs assembly. The Tube and Pipe tab contains tools you use to work with tube and pipe assemblies.

Pipe Run Tab

The Pipe Run tab is displayed when you activate a pipe run. The Pipe Run tab contains tools you use to create pipe runs.

Route Tab

When you activate a route, the Route tab is displayed. This ribbon tab contains tools specific to routing.
Inventor Assemble Tab

When you activate a tube and pipe assembly, the ISOGEN Output, Define Gravity and Tube and Pipe Styles list are made active on the Assemble tab > Begin panel and are displayed as shown in the following illustration.

![Image of Inventor Assemble Tab with ISOGEN Output and Tube and Pipe Styles]

[Image of Inventor Assemble Tab with ISOGEN Output and Tube and Pipe Styles]
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Browser

When you add tube and pipe runs to a design, a tube and pipe subassembly is created. This subassembly contains the model data for all tube and pipe runs in the model. Each run is automatically placed in a separate subassembly. The following illustration shows a tube and pipe design with various aspects active for editing, illustrating the organization of the design data.

Part Environment

The tube and pipe environment adds the Tube and Pipe Authoring tool to the ribbon on the Manage tab > Author panel, as shown in the following illustration. After you create a custom fitting or component and transform it to an iPart factory, you can use the Tube & Pipe Authoring tool to prepare the part for publishing to the Content Center Library. You can also author and publish a normal part (not an iPart) as a fitting. Once authored, you can publish the tube and pipe iPart and normal parts into the Content Center.
Creating Tube and Pipe Runs

Just as there are many tasks and procedures to follow when creating an assembly design and the parts in the assembly, there are multiple tasks and procedures to follow during the creation of a tube and pipe design. To learn how to create a tube or pipe design, you should first understand the basic steps involved in creating tube and pipe runs.

The following illustration shows a completed run that is populated with pipe segments, elbows, and couplings that are automatically placed along the route based on the current style used.
Process: Creating Tube and Pipe Runs

The following diagram gives an overview of creating tube or pipe runs.

1. Set the project environment for workspace and library access.
2. Create or open an assembly design that requires tube, pipe, or hose design content.
   - Add fittings to the assembly to set start or end locations.
3. In the assembly design, create the master run assembly.
   - Configure the tube, pipe, or hose style.
4. Set a tube, pipe, or hose style active.
5. Create a new route using manual or automatic routing or a combination of both.
   - Move, add, or delete nodes and segments to adjust the route to match design requirements.
   - Change the active style for a route.
   - Insert additional fittings.
6. Populate the route.
Master Runs Assembly and Tube and Pipe Runs

When you select to create a tube or pipe run, a single master subassembly is added to the overall assembly if the master runs subassembly does not already exist. The default browser name for this master subassembly is Tube & Pipe Runs. Every run you create in the overall assembly is added to this master runs subassembly. The number of runs you include depends on your design and manufacturing requirements.

Each run can include one or more individual routes that can share the same style or use different styles. Because you have the ability to choose unique styles, it is possible for you to have all three route types, each with different size diameters in a single run. Routes can start and end on assembly model geometry or an initial fitting dropped on the route to create a branch or fork.

In the following illustration, the browser shows that the master runs assembly Tube & Pipe Runs consists of three unique tube or pipe runs.
Exercise: Examine a Tube and Pipe Design

In this exercise, you open a model that contains rigid pipe, rigid tubing, and a flexible hose. You examine the tube and pipe environment including the ribbon and browser.

Exercise Setup

Before you start this exercise, you must activate the Tube and Pipe Design project associated with this course.


Completing the Exercise

To complete the exercise, follow the steps in this book or in the onscreen exercise. In the onscreen list of chapters and exercises, click Chapter 1: Introduction to Tube and Pipe. Click Exercise: Examine a Tube and Pipe Design.

2. On the ribbon, click the Get Started tab > Launch panel > Projects.

3. At the bottom of the Projects dialog box, click Browse:
   - Browse to the saved location of the data set, for example C:\AIP 2010\Tube and Pipe Design.
   - Click Tube and Pipe Design.ipj.
   - Click Open.
   - Click Done.
Examine a Tube and Pipe Design

1. Open Tube and Pipe Environment.iam. The assembly includes several runs including rigid pipe, bent tubing, and flexible hose.

2. In the browser, click Bulkhead:1 to highlight the component in the assembly.

3. In the browser, expand Bulkhead:1. While observing the component in the assembly, change the offset for the Flush15 constraint to 220 mm. The tube and pipe runs update to reflect changes you made to the position of the bulkhead.

4. In the browser, right-click Frame-Steel:1. Select Enabled to turn off this option so that you can see the tube and pipe runs.

5. In the browser, right-click Tube and Pipe Runs. Click Edit.

   On the ribbon, the Tube and Pipe tab is displayed and made active. On the Tube and Pipe tab, the tools and the tube and pipe style list are displayed.

6. On the Run panel, review the available styles. The document includes styles for rigid pipe, tube, and flexible hose.

7. In the browser, expand Run01. The run subassembly contains two routes. Route01 defines the path for the rigid pipe with fittings. Route02 defines the path for the tubing. The run subassembly also contains the parts for both routes. The fittings above Route01 in the browser are the start and end connections that were placed before the routes were created.

8. In the browser, double-click Run01 to edit the run. The Pipe Run tab is displayed.
9. In the browser, double-click Route01 to edit the route. The Route tab is displayed.

10. In the browser, expand Autoroute 1. The route contains two manually placed route points that define the start and end points for the route. The four points in the Autoroute 1 group define the points that were created using the Autorouting tool.

11. On the ribbon, click the Route tab > Create panel > Move Segment. Move the cursor over the segment shown in the following illustration. When the drag handles display, drag the segment away from the frame.

12. Right-click in the graphics window. Click Done.

13. On the ribbon, click the Route tab > Exit panel > Finish Route to return to the Runs subassembly. The rigid pipe run updates based on the changes you made to the route.

14. In the browser, double-click Route02 to edit the tube route. Zoom in to the route. The route consists of linear segments with rounded corners. In this route, most of the linear segments are dimensioned because their route points were placed manually.

15. In the browser, double-click Run02 to edit the subassembly that contains the flexible hose runs. Each flexible hose is contained in its own subassembly.

16. Expand Flexible Hose 02. Double-click Hose02 to edit the route. The route contains two points: the start point and end point.
17. In the model, examine the route. A flexible hose route consists of a single spline that passes through the route points.

18. Return to the top-level assembly.
19. Close all files without saving changes.
Chapter Summary

This chapter introduced you to the tube and pipe environment in Autodesk Inventor. Using the tube and pipe environment, you can create rigid pipe, bent tube, and flexible hose runs between your assembly components.

Having completed this chapter, you can:

■ Describe the tube and pipe environment.