SIMA EXAMPLE

Pipe Layer Model in Sima

Valid from SIMA version 4.6

SIMA Example

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Date: November 2023

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1 Introduction

This document introduces an example model of a pipe layer vessel conducting pipe laying operation, as shown in Figure 1-1. The pipe layer has a stinger at the stern of the vessel. The pipe is supported by the stinger and lowering towards the seabed.

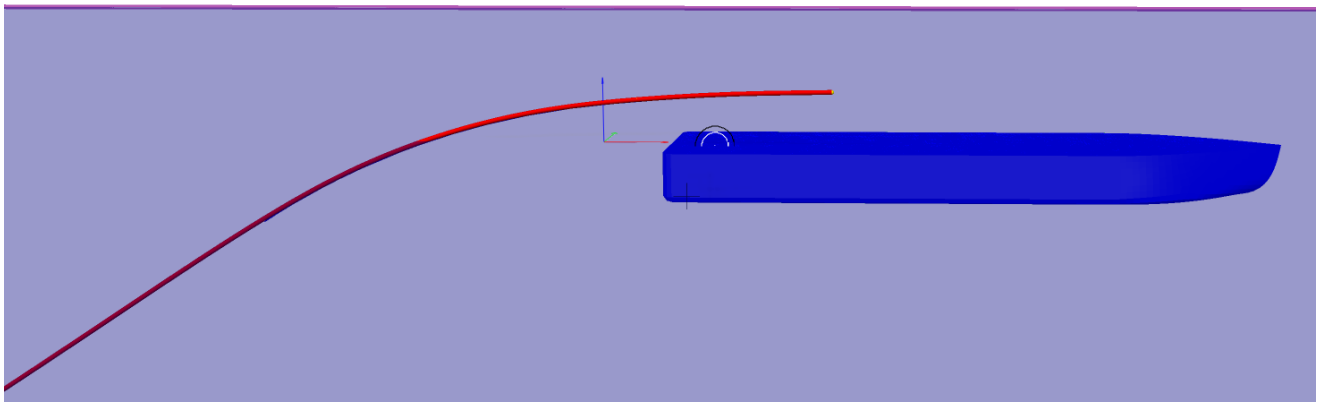

Figure 1-1 Pipe Layer analysis model's 3D view

To open the example model, create a new SIMA workspace and import the "PipeLayer.stask" file (*File → Import → SIMA → SIMA Task Archive (.stask)*). This will import a Riflex coupled analysis model containing the example.

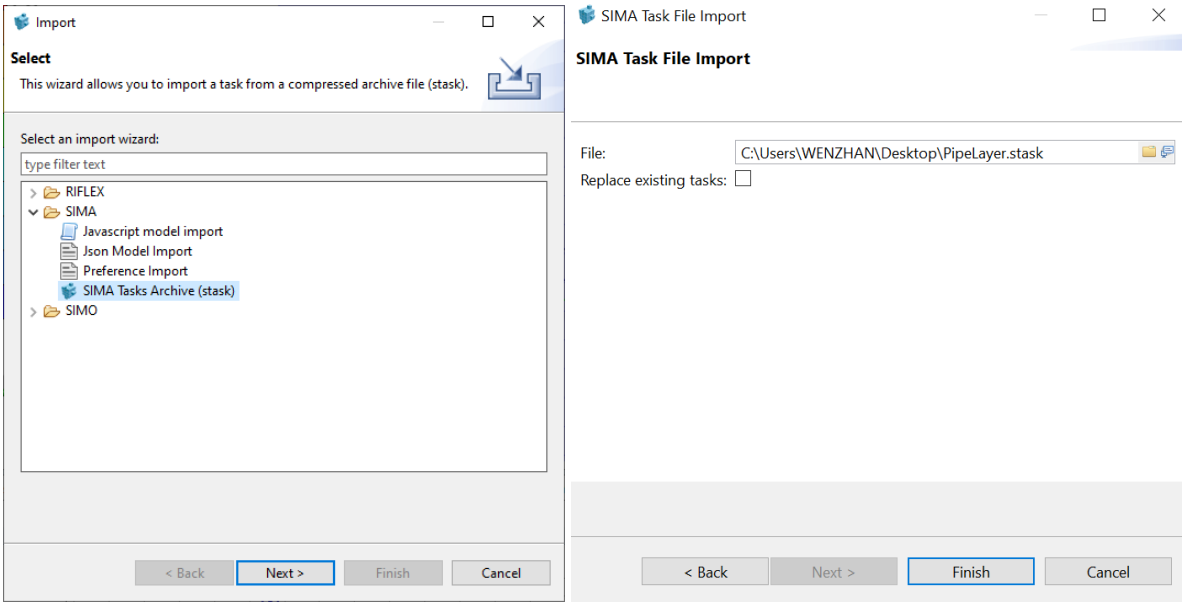

Figure 1-2 Importing the .stask file

2 About the Model

The model consists of several objects: the pipe lay vessel (**PIPPYV**), the stinger (**Stinger#**) and pipe (**S_pipe**). The content of the OOL (**Oil Export Line**) has been defined in the components folder in the Sima navigator (**oil**). Elastic contact surface and roller contacts are modelled in example as stinger, to support the pipe. The objects are shown in Figure 2-1. The overview of elastic contact surface and roller contact are shown in Figure 2-2.

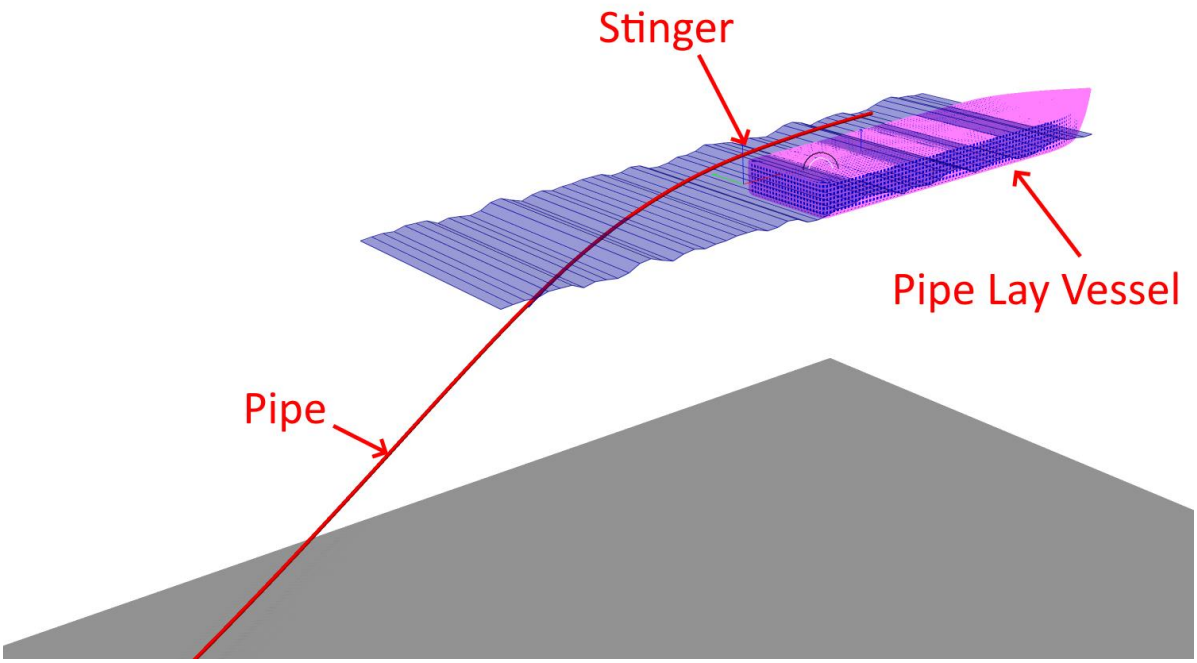

Figure 2-1 The objects in the model

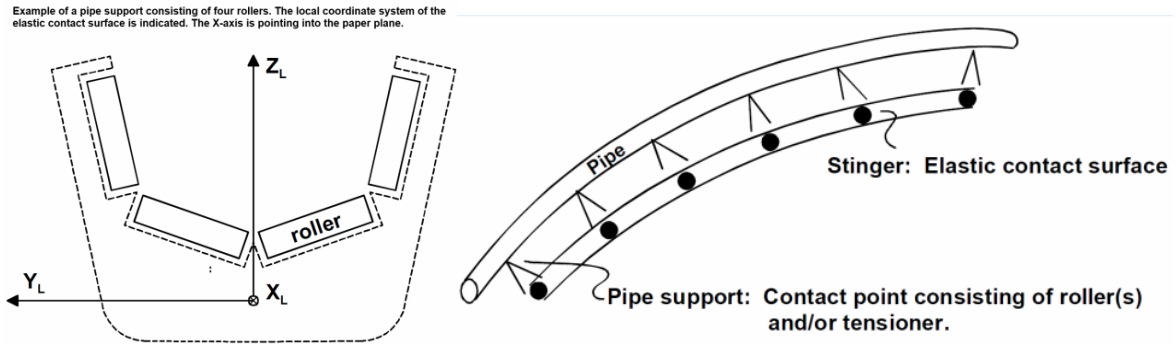

Figure 2-2 Elastic surface and roller contact in Sima

The pipe lay vessel is modelled by using Support Vessel in Sima. The movement of the vessel is based on the first order motion transfer function (motion RAO). The water depth is 372 m. 6 parameters Jonswap wave spectrum is used with Omega = 1.0472, Alpha = 0.0755, Beta = 1.25, Gamma = 2.2. No other environment loads are applied in this example.

The model uses the elastic contact surface object to simulate the stinger. Note that the lines building the stinger are connected to fairleads on the vessel. A tensioner is also modelled in order to hold the pipe.

In the screen shot below, you can find how to define the elastic contact surface in Sima, at the top end, you need a tensioner to hold the pipeline and line with different roller contact properties to model the stinger, as showed in Figure 2-3.

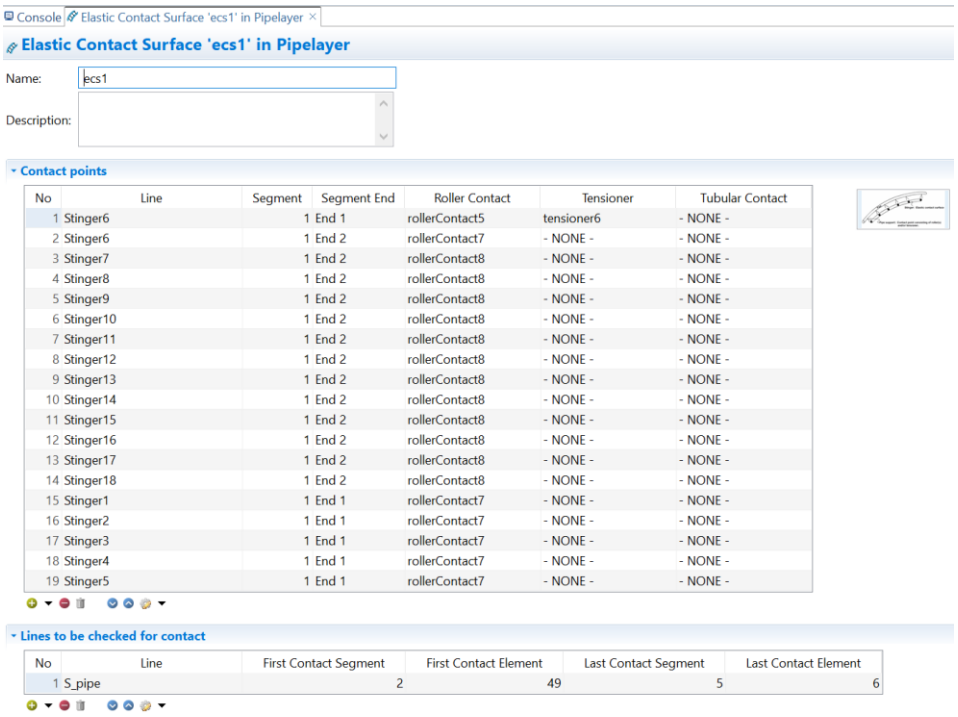

Figure 2-3 Elastic contact surface setting

You can find the roller contacts elements, tensioner, elastic contact surfaces and support vessel in Sima navigator as showed in Figure 2-4.

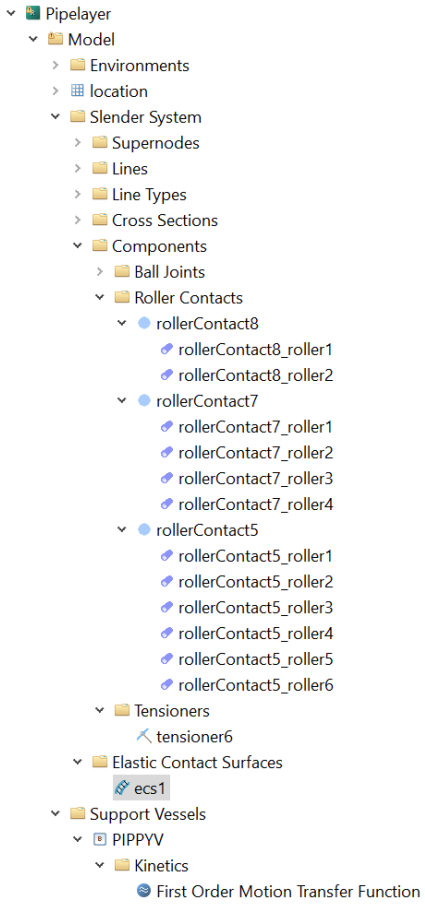

Figure 2-4 Key elements in the example model

3 Results

To run the simulation, run the dynamic analysis in the Initial condition. The simulation length has been set to 100 s with 0.01 s time step just for demonstrate purpose, in your own analysis, you may set longer simulation length. Some results are already set to be stored in the model. For example, pipe displacements, pipe force response and the 3D visualization of dynamic analysis etc.

The tension and moment of pipe segment 1, element 20 are shown in Figure 3-1. The displacement in Z direction of pipe segment 1, node 21 is shown in Figure 3-2.

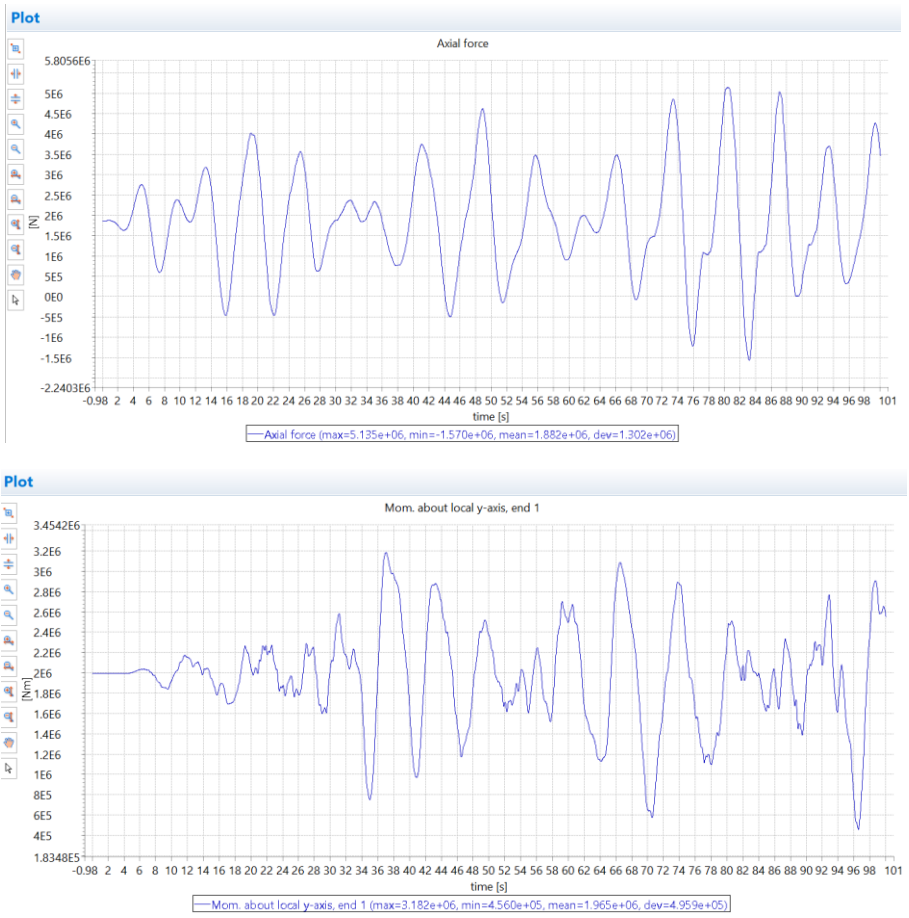

Figure 3-1 Tension and moment of pipe segment 1, element 20

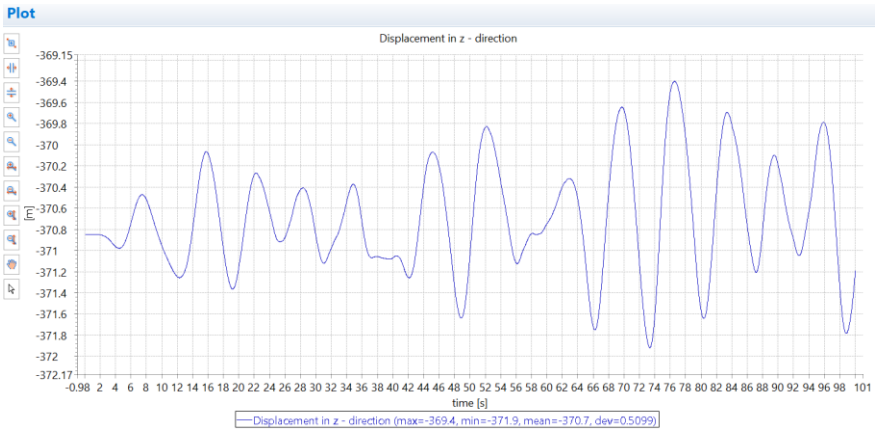

Figure 3-2 Displacement in Z direction of pipe segment 1, node 21

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