Stinger Builder™

User Manual

Version: 2.0.1

INDEX

1 FUNCTION

Stinger Builder™ is a sub software of OFFPIPE Assistant™ which is developed to build precise laybarge and stinger model for OFFPIPE Assistant™, from which support roller coordinates are generated according to dimension and bending radius of the pipeline. By comparing thousands of stinger profile, Stinger Builder™ can provide best stinger profile which makes the Y coordinates of stinger tip roller lowest. The support roller coordinates can be used by other commercial offshore pipeline analysis software, such as OFFPIPE.

Stinger Builder™ has several features as following:

1. Easy and precise laybarge and stinger modeling

It is easy for user using Stinger Builder™ to construct precise model of laybarge and stinger by filling some blanks. The model can be saved as model file and read by the software directly. Users can get support roller coordinates rapidly corresponding to the bending radius of pipeline specified by users. This function makes it possible to build a laybarge model database of a company, which can be called directly in calculation.

2. Rapid and precise calculation

For any input, the calculation will be completed in a very short time. All factors influence the support roller coordinates are considered during calculation, even the outside diameter of pipeline. Both maximum allowed error and calculation precision can be adjusted by user.

3. Standard output and stinger model show

When the calculation completed, support roller coordinates will show in standard input format of OFFPIPE, users can directly copy the output result and paste it into OFFPIPE input files. The 2D and 3D stinger model will show in a figure and the configuration of laybarge and stinger will be provided as well.

2 INSTALLATION

To start to use Stinger Builder™, please:

1. Insert the installation CD into the CD-ROM drive, or unzip the installation pack file.

2. Copy “Stinger Builder” folder in root directory of installation CD or installation pack file to hard disk of your PC.

3. Insert the attached hard lock into one of USB port in your PC.

4. Double click “Stinger Builder.exe” icon in the folder to start the software.

Stinger Builder™ runs on PC with Windows XP or Windows 7.

3 HOW TO USE

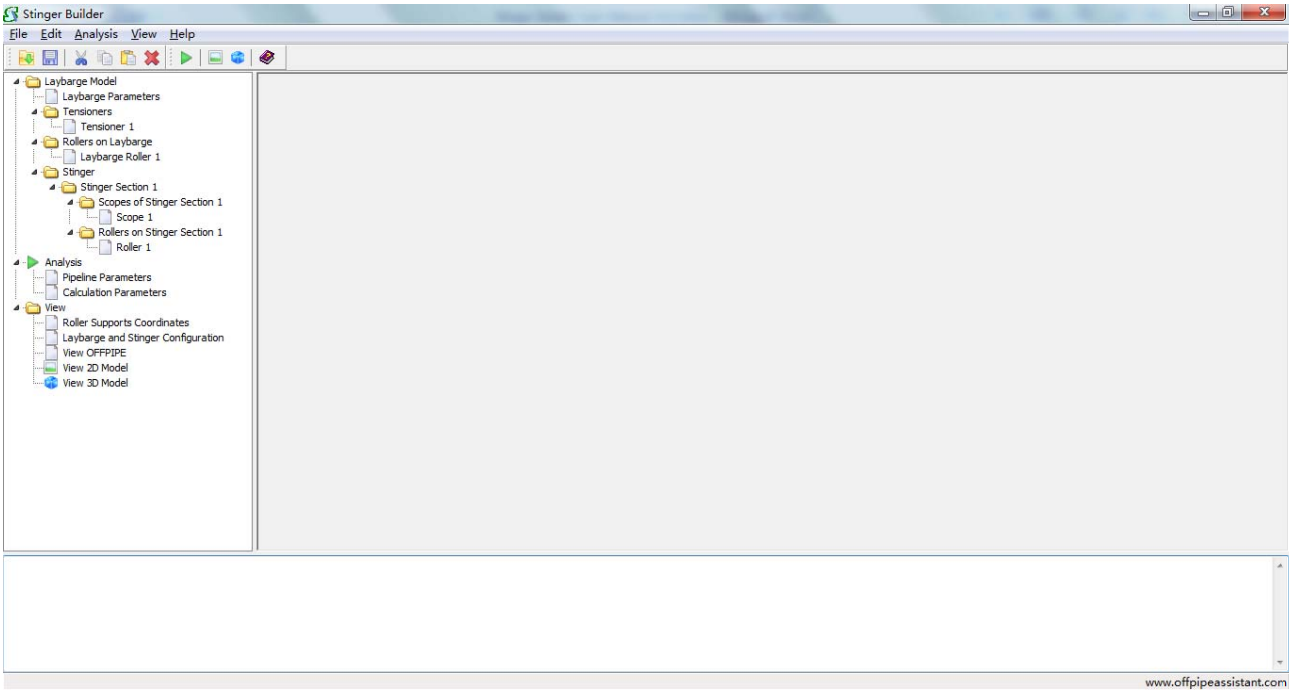

Fig. 3.1 Main interface of Stinger Builder™

Figure 3.1 shows the main interface of Stinger Builder™, which includes 4 main parts:

1. Main menu and tool buttons are in the top of window, which are used to run important functions of the software.

2. A tree view is in the left of interface, users can go to any part of the software by clicking the corresponding item in the tree view.

3. In the right, there is the operation window, which is used to edit model, run analysis and view the results.

4. In the bottom is the description window, it shows some descriptions and guides for user.

Brief procedure of running Stinger Builder™ is shown as following:

1. Edit or load laybarge model.

(1) Click “Laybarge Model” in the tree view, and click the buttons to load or save your laybarge & stinger model. If there is no model to load, then go to the next step to edit your model.

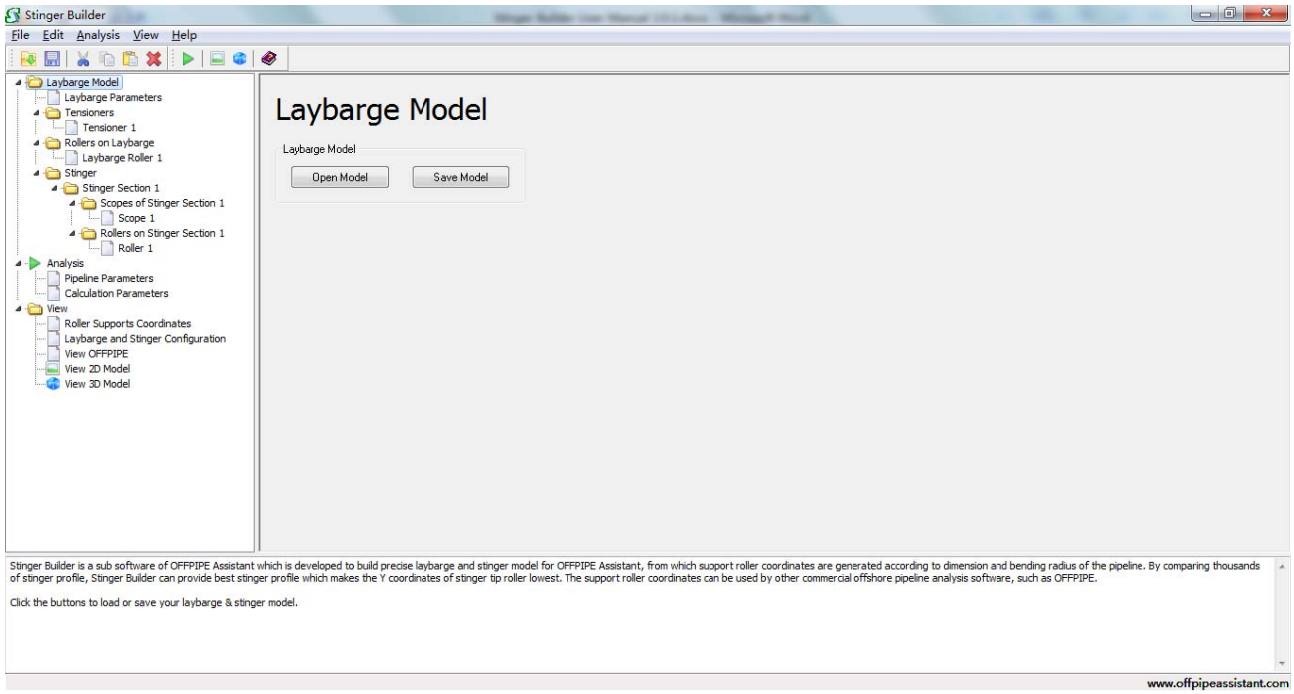

Fig. 3.2 Load or save model

(2) Click “Laybarge Parameters” in the tree view, and input laybarge parameters in operation window:

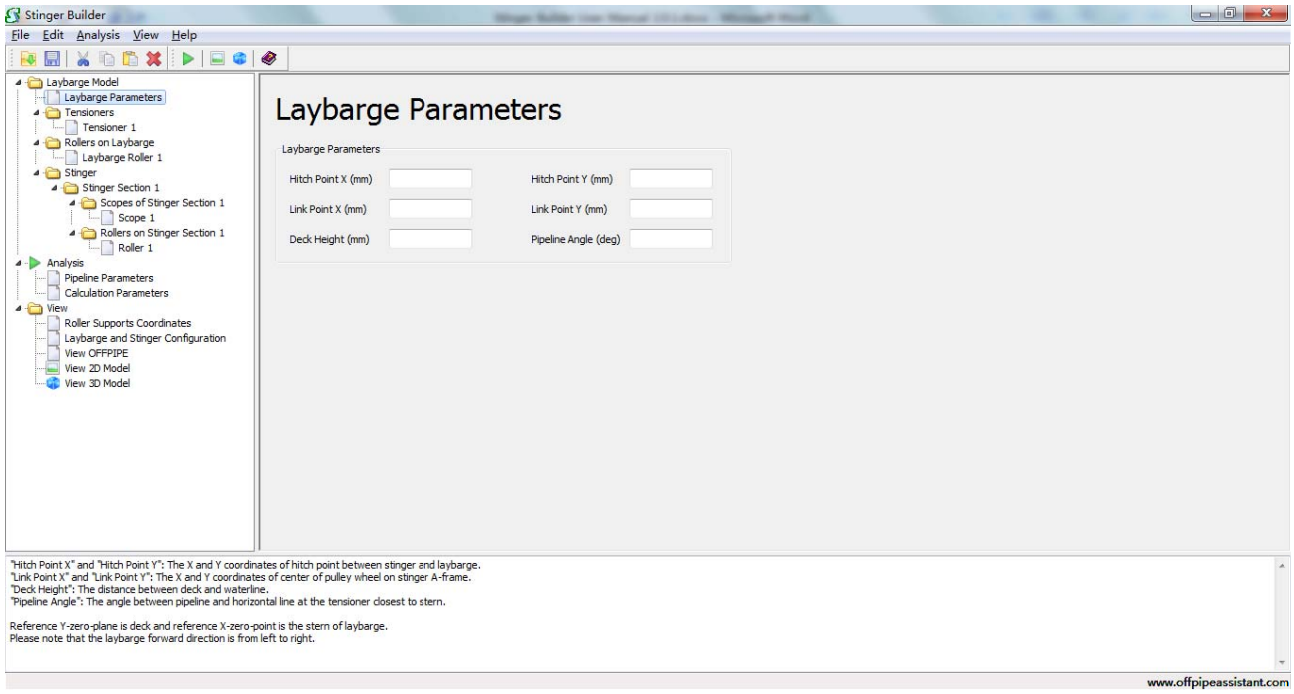

Fig. 3.3 Input laybarge parameters

In which:

“Hitch Point X” and “Hitch Point Y”: The X and Y coordinates of hitch point between stinger and laybarge.

“Link Point X” and “Link Point Y”: The X and Y coordinates of center of pulley wheel on

stinger A-frame.

"Deck Height": The distance between deck and waterline.

"Pipeline Angle": The angle between pipeline and horizontal line at the tensioner closest to stern.

Reference Y-zero-plane is deck and reference X-zero-point is the stern of laybarge. Please note that the laybarge forward direction is from left to right.

(3) Click "Tensioners" in the tree view to specify quantity of tensioners:

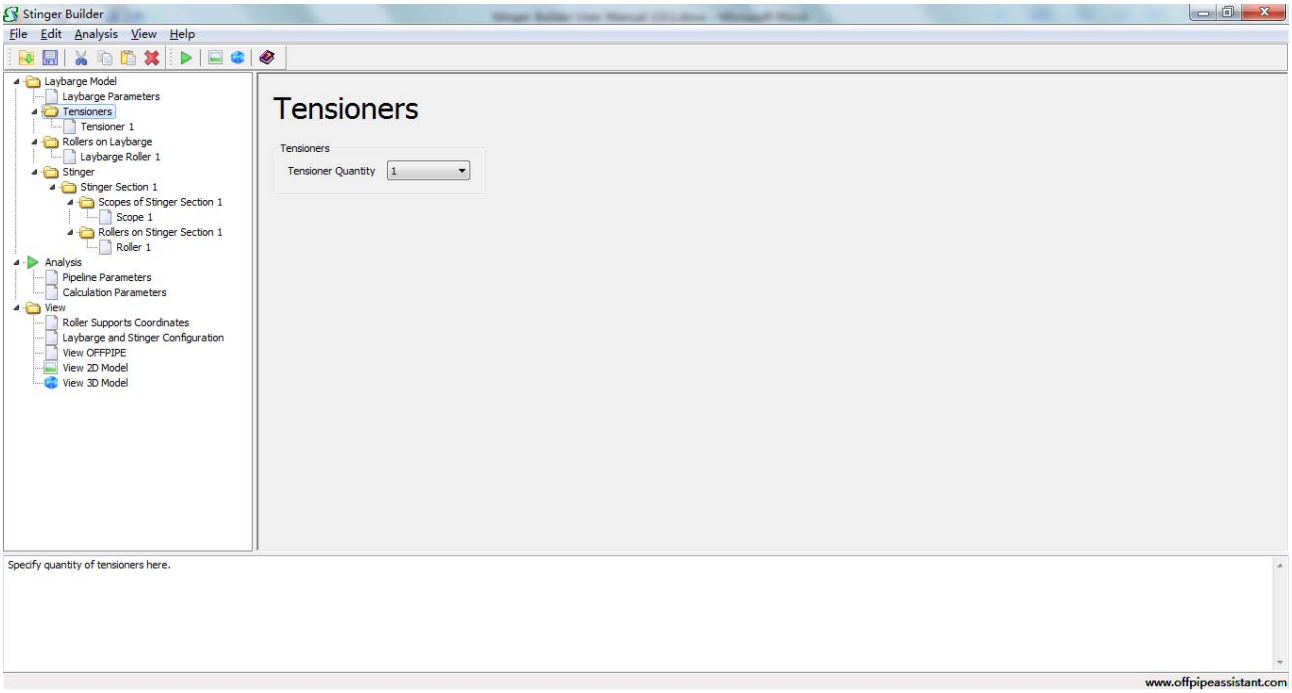

Fig. 3.4 Specify quantity of tensioners

(4) Click "Tensioner X" in the tree view, and input parameters for each tensioner, in which:

"Root Point X" and "Root Point Y": The X and Y coordinates of installation point of tensioner on deck.

"Height": The distance between installation point of tensioner on deck and the bottom of pipe (B.O.P.), which is the lowest point of the pipe cross section. The tensioners and rollers on laybarge are numbered from bow to stern.

"Length": Length of the tensioner. This parameter has no influence on calculation, used only when viewing OFFPIPE format result.

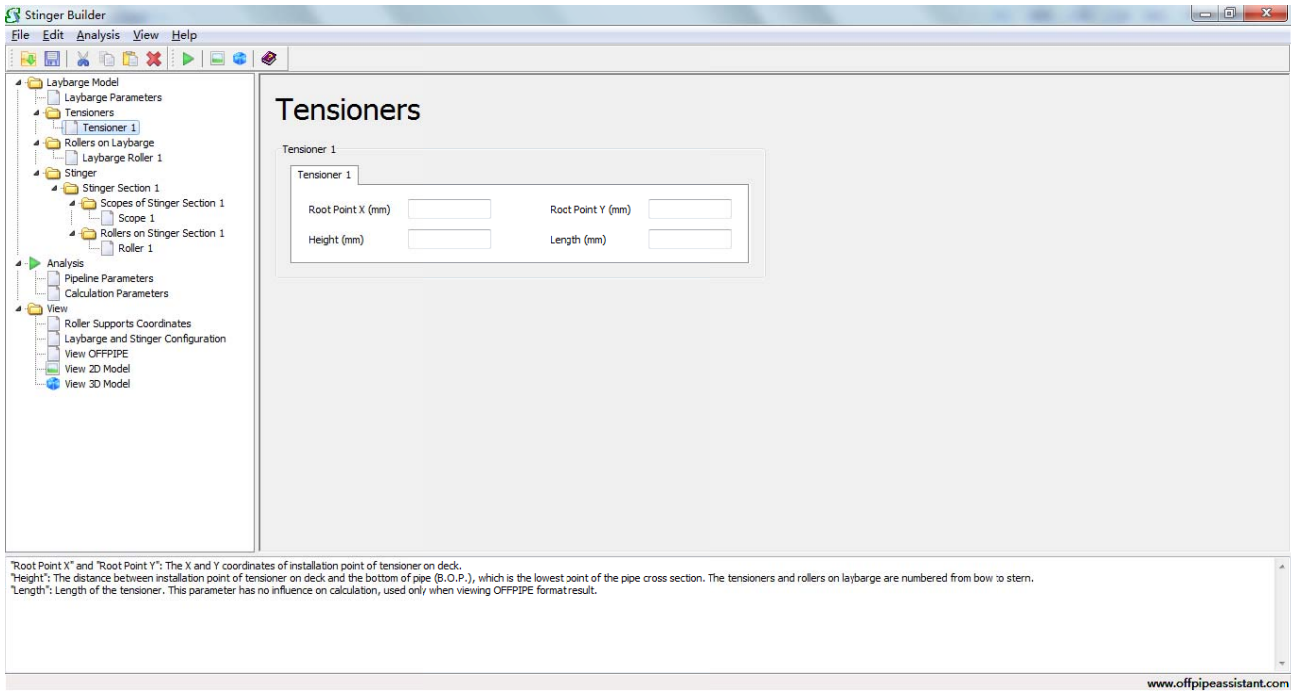

Fig. 3.5 Input parameters for each tensioner

(5) Click “Rollers on Laybarge” in the tree view to specify quantity of rollers on laybarge:

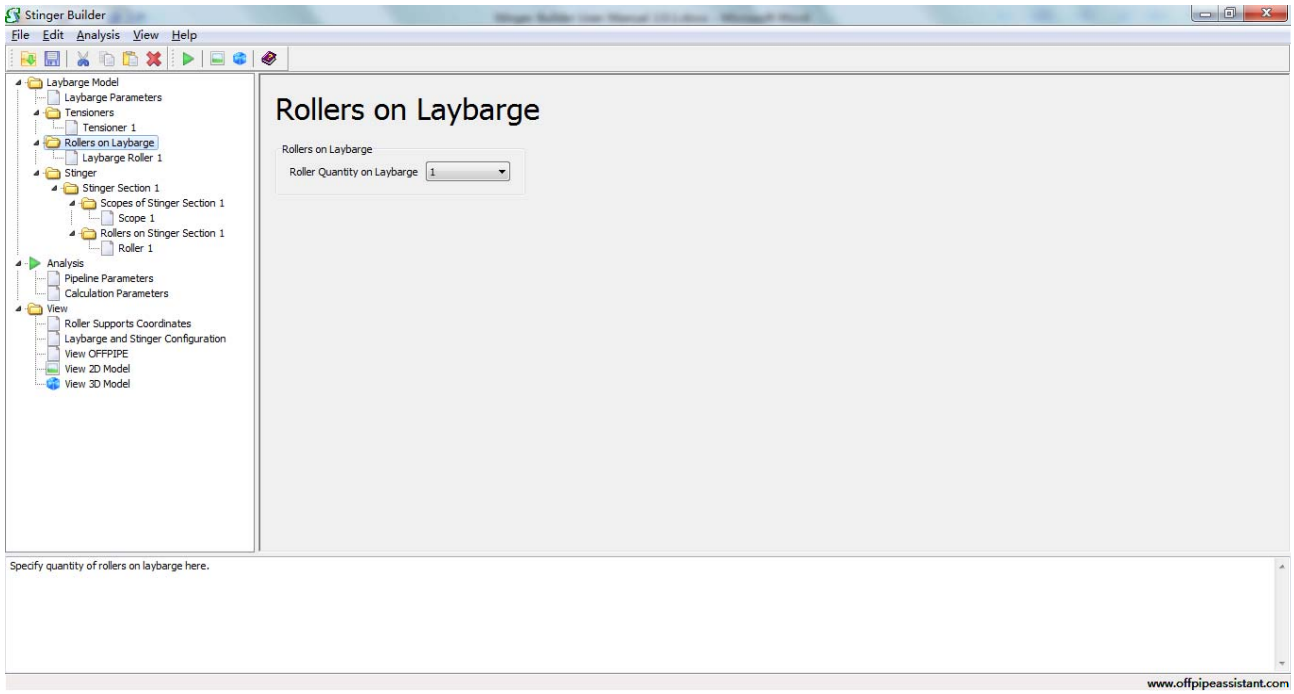

Fig. 3.6 Specify quantity of laybarge rollers

(6) Click “Laybarge Roller X” in the tree view, and input parameters for each laybarge roller:

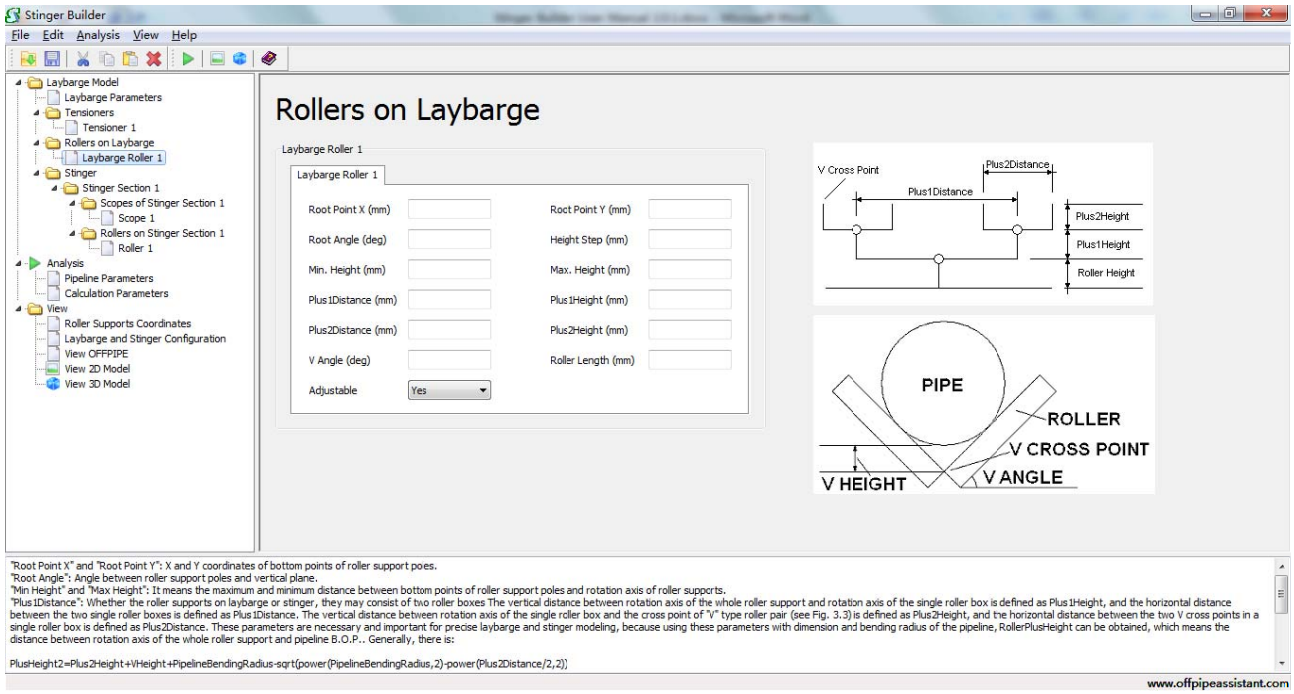

Fig. 3.7 Input parameters for each laybarge roller

In which:

“Root Point X” and “Root Point Y”: X and Y coordinates of bottom points of roller support poles.

“Root Angle”: Angle between roller support poles and vertical plane.

“Height Step”: The minimum length that the roller height can be adjusted each time.

“Min. Height” and “Max. Height”: Reference to Fig. 3.8. It means the maximum and minimum distance between bottom points of roller support poles and rotation axis of roller supports.

“Plus1Distance”: Reference to Fig. 3.8. Whether the roller supports on laybarge or stinger, they may consist of two roller boxes, as shown in Fig. 3.8. The vertical distance between rotation axis of the whole roller support and rotation axis of the single roller box is defined as Plus1Height, and the horizontal distance between the two single roller boxes is defined as Plus1Distance. The vertical distance between rotation axis of the single roller box and the cross point of “V” type roller pair (see Fig. 3.9) is defined as Plus2Height, and the horizontal distance between the two V cross points in a single roller box is defined as Plus2Distance. These parameters are necessary and important for precise laybarge and stinger modeling, because using these parameters with dimension and bending radius of the pipeline, RollerPlusHeight can be obtained, which means the distance between rotation axis of the whole roller support and pipeline B.O.P.. Generally, there is:

PlusHeight2=Plus2Height+VHeight+PipelineBendingRadius
-sqrt(power(PipelineBendingRadius,2)-power(Plus2Distance/2,2))
PlusHeight1=Plus1Height+PipelineBendingRadius-PlusHeight2
-sqrt(power(PipelineBendingRadius-PlusHeight2,2)-power(Plus1Distance/2,2))
RollerPlusHeight=PlusHeight1+PlusHeight2

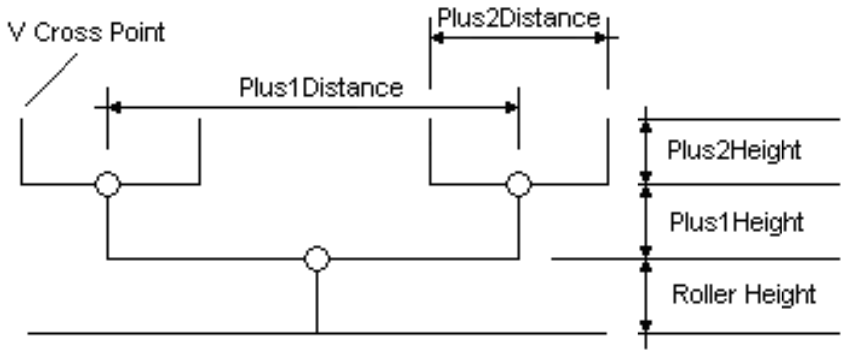

Fig. 3.8 Definition of roller height and plus height

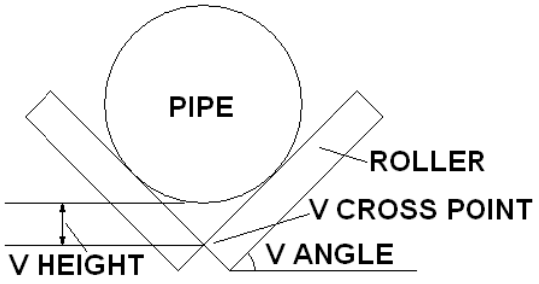

Fig. 3.9 Definition of V angle and V cross point

If there is only one roller box, then Plus1Height and Plus1Distance should be defined as zero. If there is only one pair of roller and no roller box, then Plus1Height, Plus1Distance, Plus2Height and Plus2Distance should be defined as zero.

“V Angle”: Angle between rollers of “V” type roller pair and horizontal plane, as shown in Fig. 3.9.

“Roller Length”: Length of the barge roller. This parameter has no influence on calculation, used only when viewing OFFPIPE format result.

“Adjustable”: When no result can be generated, whether allowed this roller support to increase its height range to conduct next calculation. Users only need to specify “Yes” to those roller supports they can endure some errors with.

All the barge rollers before or after tensioners can be input.

(7) Click “Stinger” in the tree view to specify quantity of stinger sections:

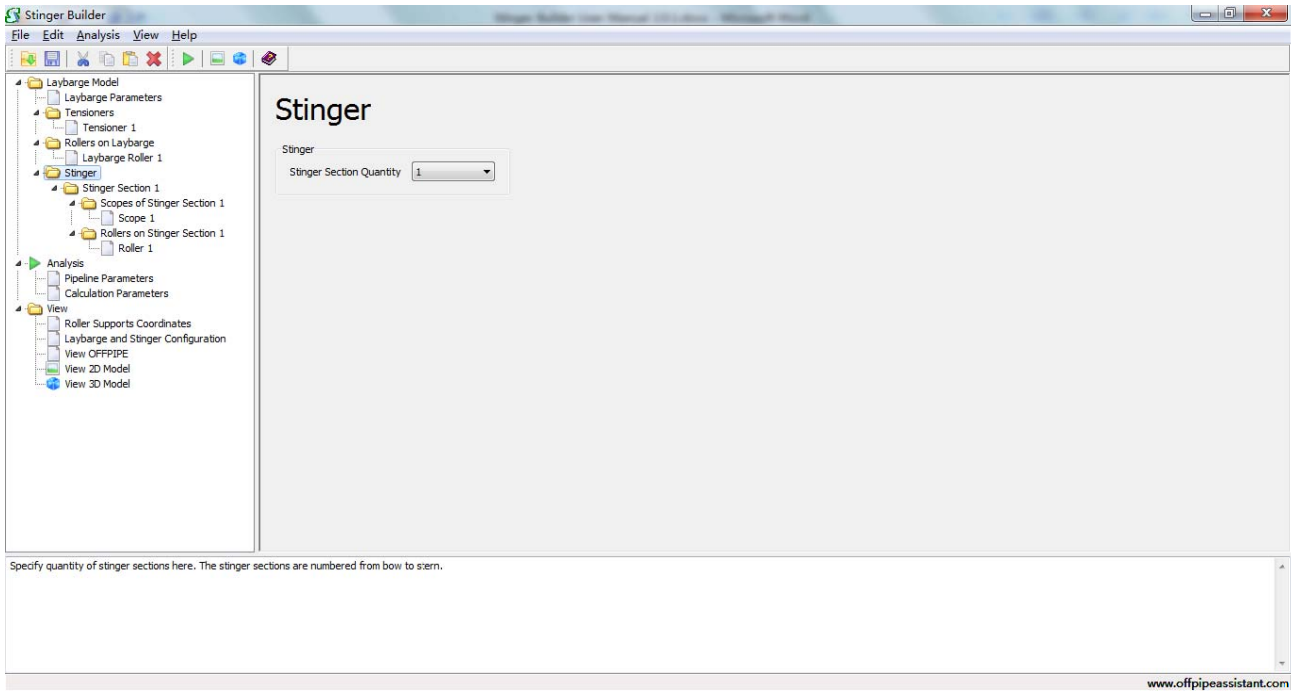

Fig. 3.10 Specify quantity of stinger sections

(8) Click “Stinger Section X” in the tree view, and input parameters for each tensioner. Stinger sections are numbered from bow to stern:

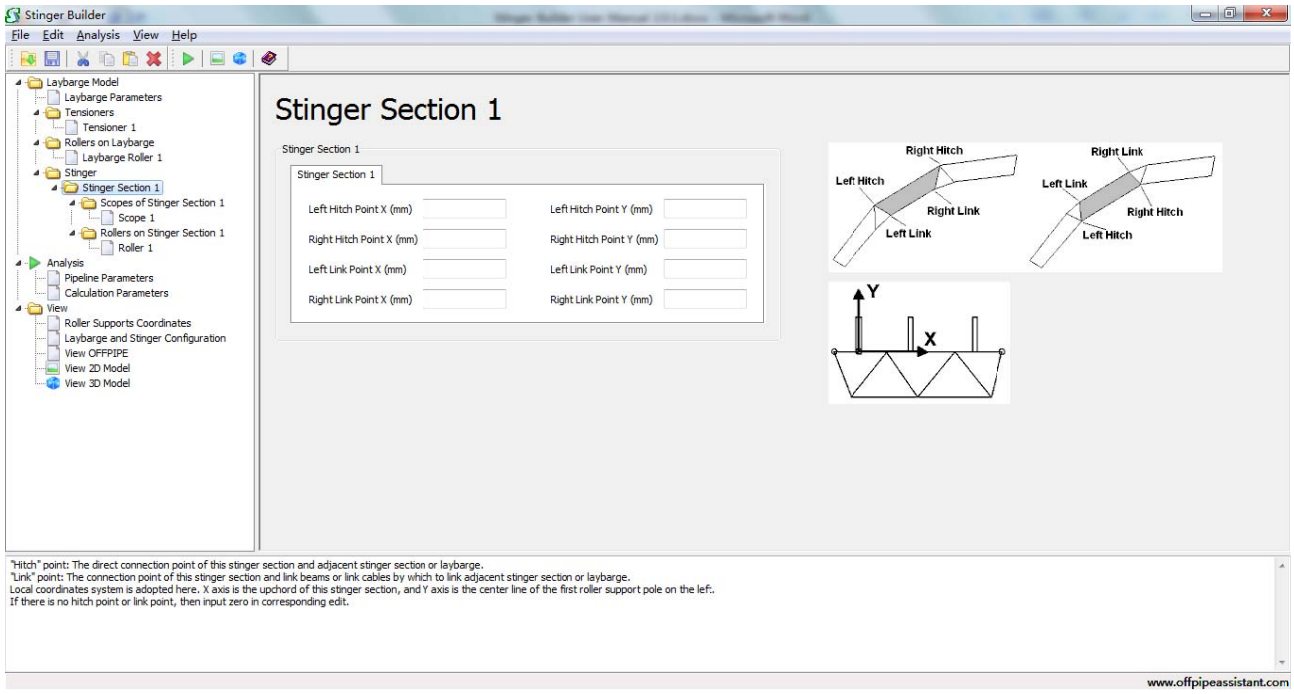

Fig. 3.11 Input parameters for each stinger section

In which:

“Hitch Point”: The direct connection point of this stinger section and adjacent stinger section or laybarge (see Fig. 3.12).

"Link Point": The connection point of this stinger section and link beams or link cables by which to link adjacent stinger section or laybarge (see Fig. 3.12).

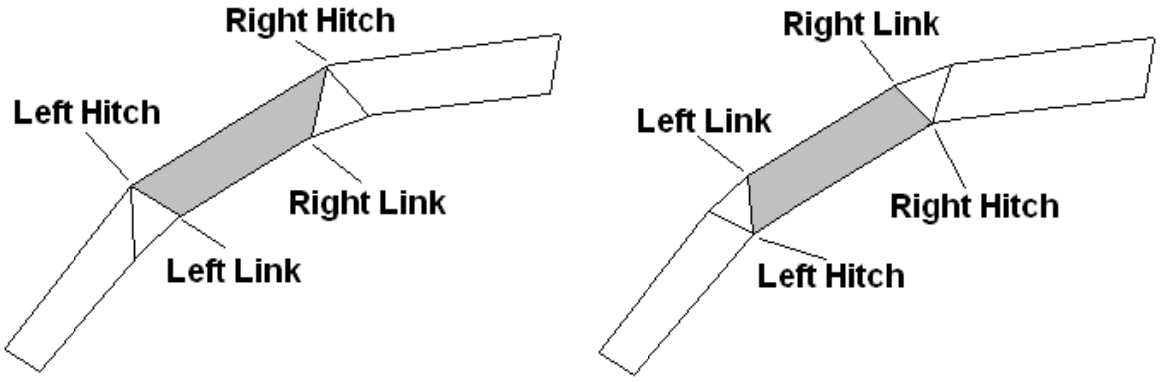

Fig. 3.12 Definition of hitch and link point

Local coordinates system is adopted here. X axis is the upchord of this stinger section, and Y axis is the center line of the first roller support pole on the left, as shown in Fig. 3.12.

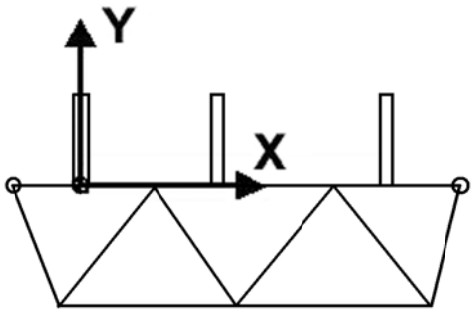

Fig. 3.13 Local coordinates system

If there is no hitch point or link point, then input zero in corresponding edit.

(9) Click "Scopes of Stinger Section X" in the tree view to specify the scope quantity of the current stinger section.

Some stinger has only several fixed angle or link beam length, or limited maximum or minimum angle or link beam length. The scope here means the scope of upchord angle or link beam length between this stinger section and the last stinger section. For the first stinger section, the scope means the scope of upchord angle between this stinger section and the laybarge deck, or link wire length between this stinger section and the laybarge. User can specify the scope quantity of the current stinger section, which means how many separate scopes there are for the current stinger section.

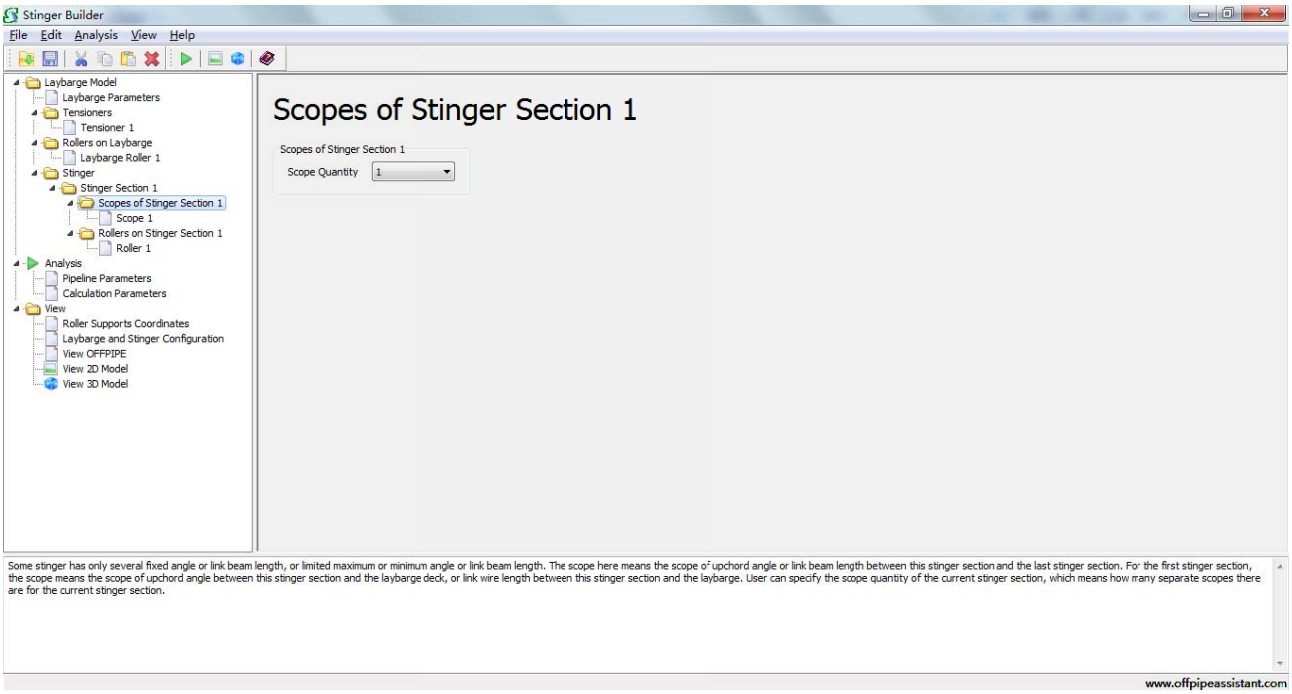

Fig. 3.14 Specify scope quantity of the current stinger section

(10) Click “Scope X” in the tree view, and input parameters for each scope:

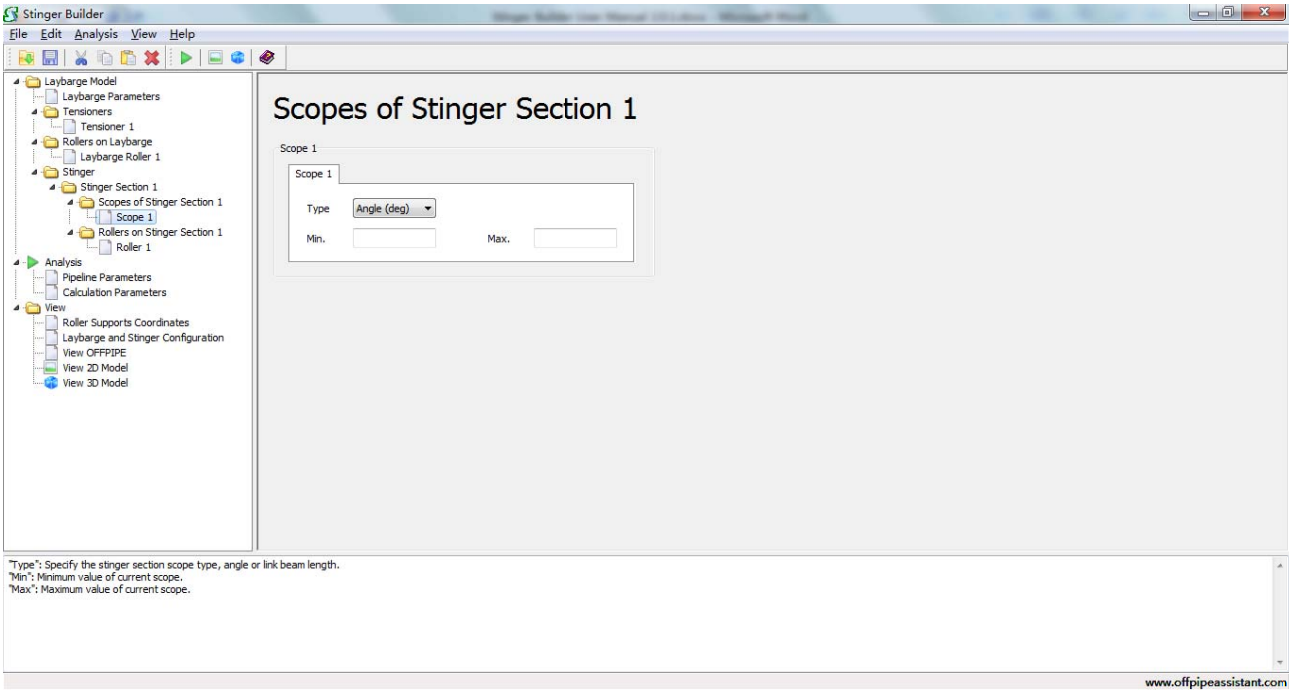

Fig. 3.15 Input parameters for each scope of the current stinger section

In which:

“Type”: Specify the stinger section scope type, angle or link beam length.

“Min”: Minimum value of current scope.

“Max”: Maximum value of current scope.

(11) Click “Rollers on Stinger Section X” in the tree view to specify the rollers quantity on the current stinger section:

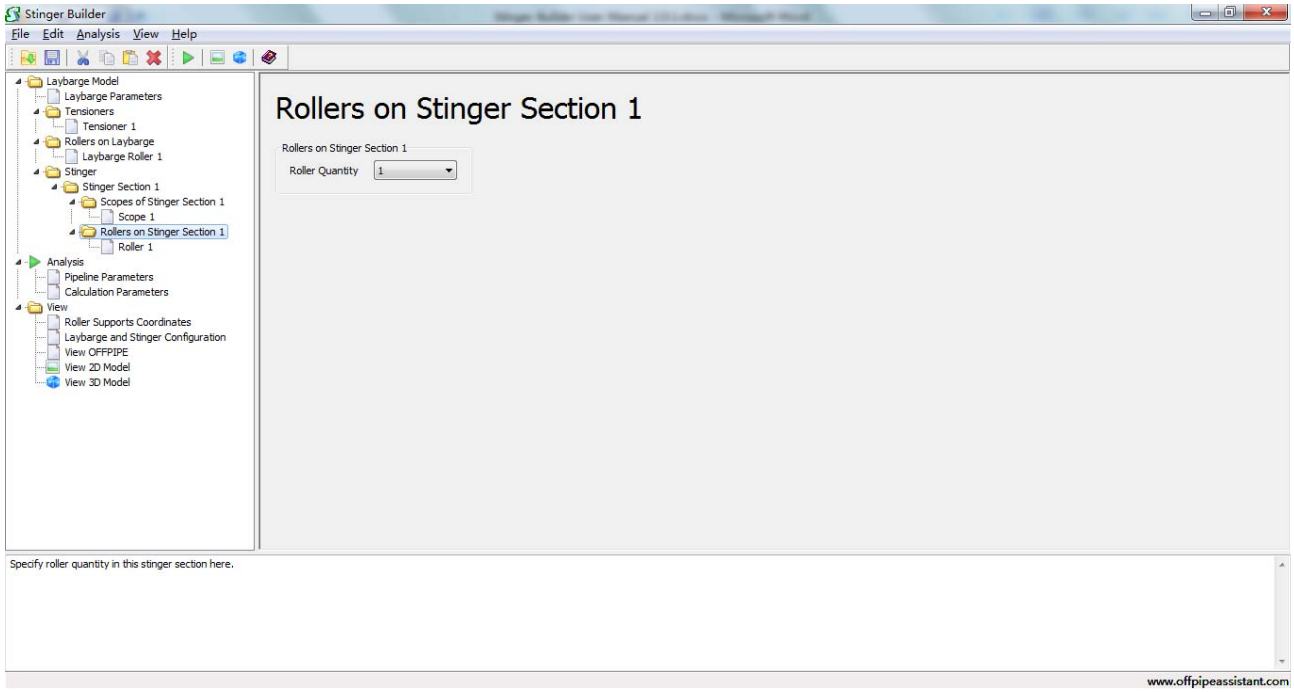

Fig. 3.16 Specify rollers quantity on the current stinger section

(12) Click “Roller X” in the tree view, and input parameters for each roller on the current stinger section:

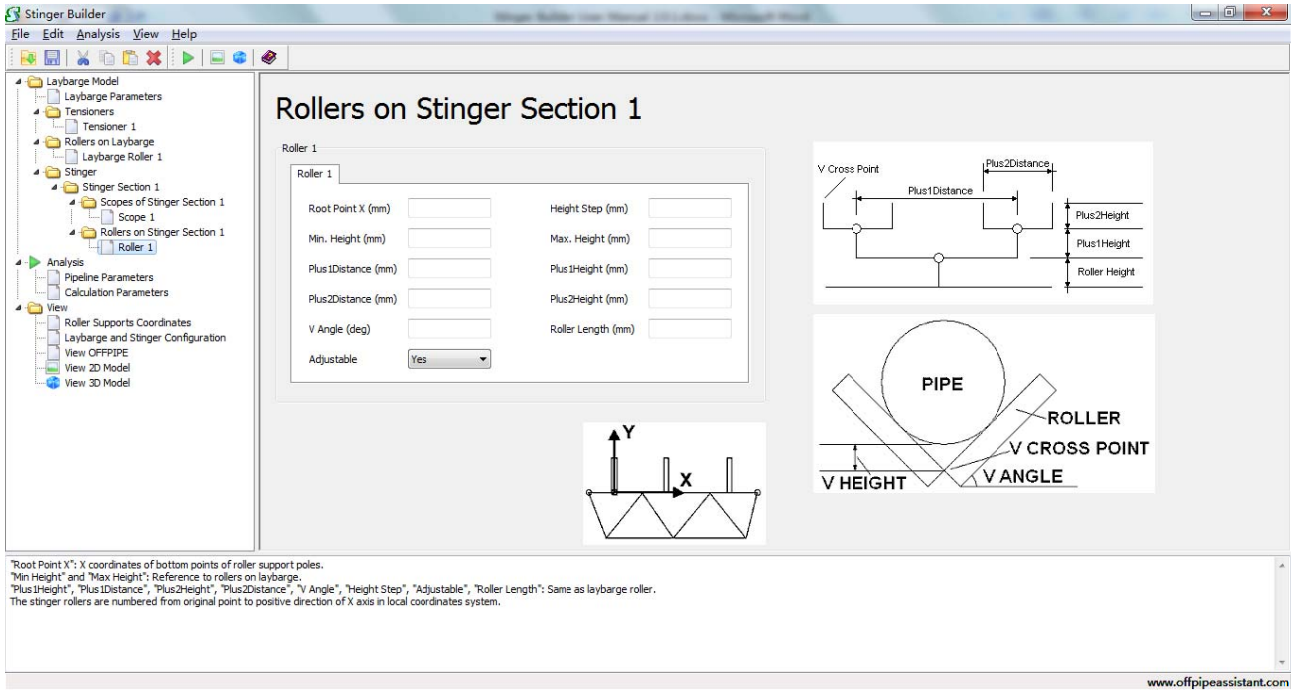

Fig. 3.17 Input parameters for each roller on the current stinger section

In which:

"Root Point X": X coordinates of bottom points of roller support poles.

"Height Step", "Min Height", "Max Height", "Plus1Height", "Plus1Distance", "Plus2Height", "Plus2Distance", "V Angle", "Roller Length", "Adjustable": Same as laybarge roller.

The stinger rollers are numbered from original point to positive direction of X axis in local coordinates system.

2. Input analysis parameters and run the analysis to get roller supports coordinates.

(1) Click "Analysis" in the tree view, and select parameters you want to input, or run the analysis to get roller supports coordinates.

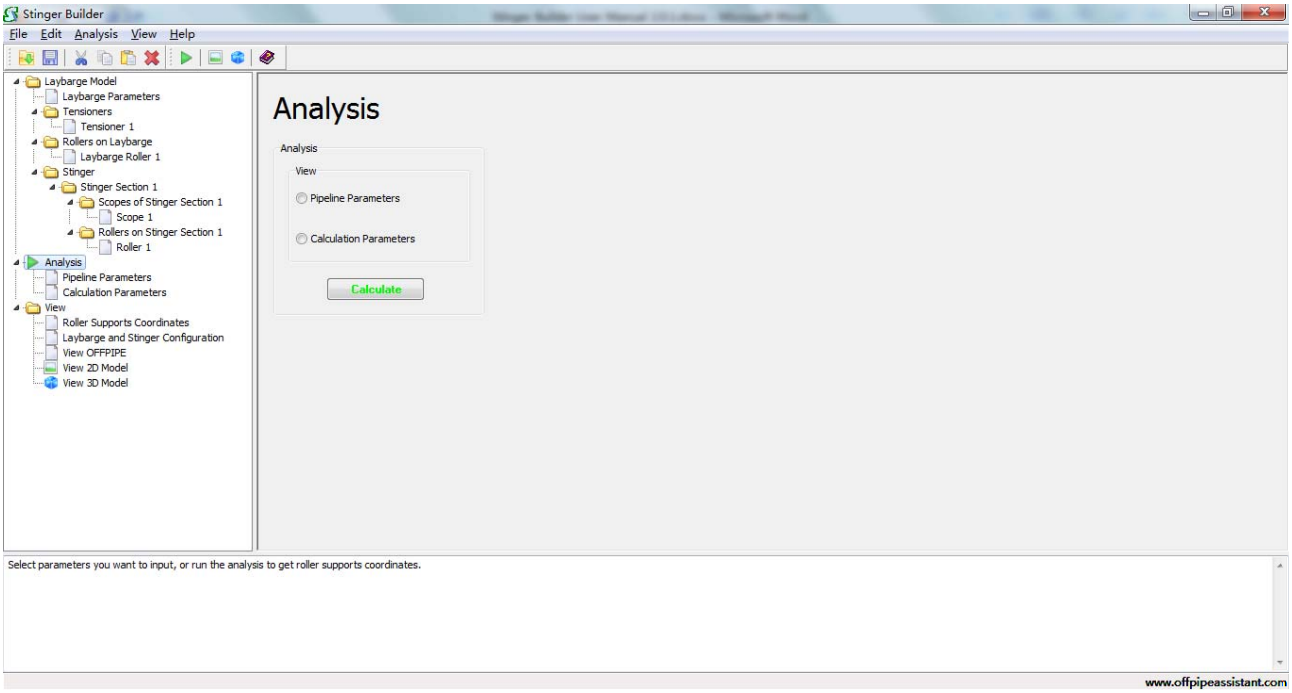

Fig. 3.18 Select parameters to be input or run the analysis

(2) Click "Pipeline Parameters" in the tree view, and input pipeline parameters in operation window, in which:

"Barge Radius": Pipeline bending radius on the laybarge.

"Stinger Radius": Pipeline bending radius on the stinger.

"Tangent X": The X coordinates of tangent point between barge pipeline arc and stinger pipeline arc.

"Pipe Dimension": Pipeline size references to API "Specification for Line Pipe" (2000). The outside diameter of the pipeline size specified will show in "Outside Diameter" edit.

"Coat Thickness": Thickness of the pipeline coat.

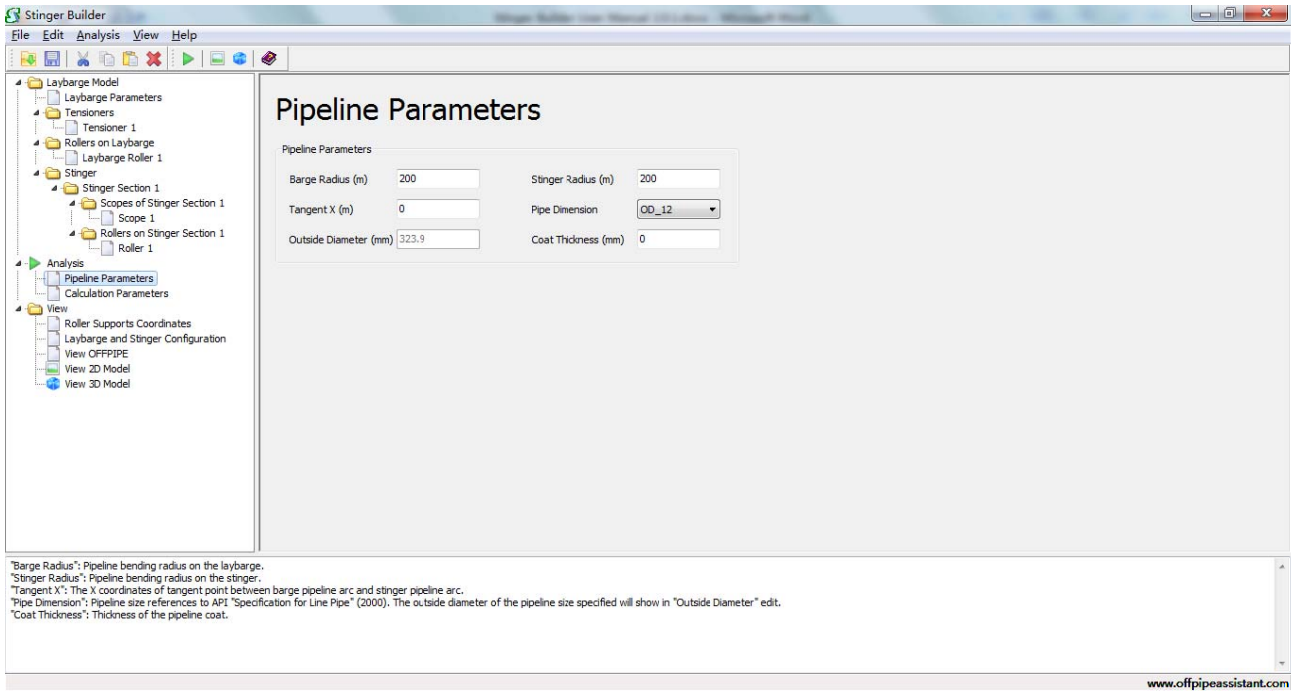

Fig. 3.19 Input pipeline parameters

(3) Click “Calculation Parameters” in the tree view, and input calculation parameters in operation window:

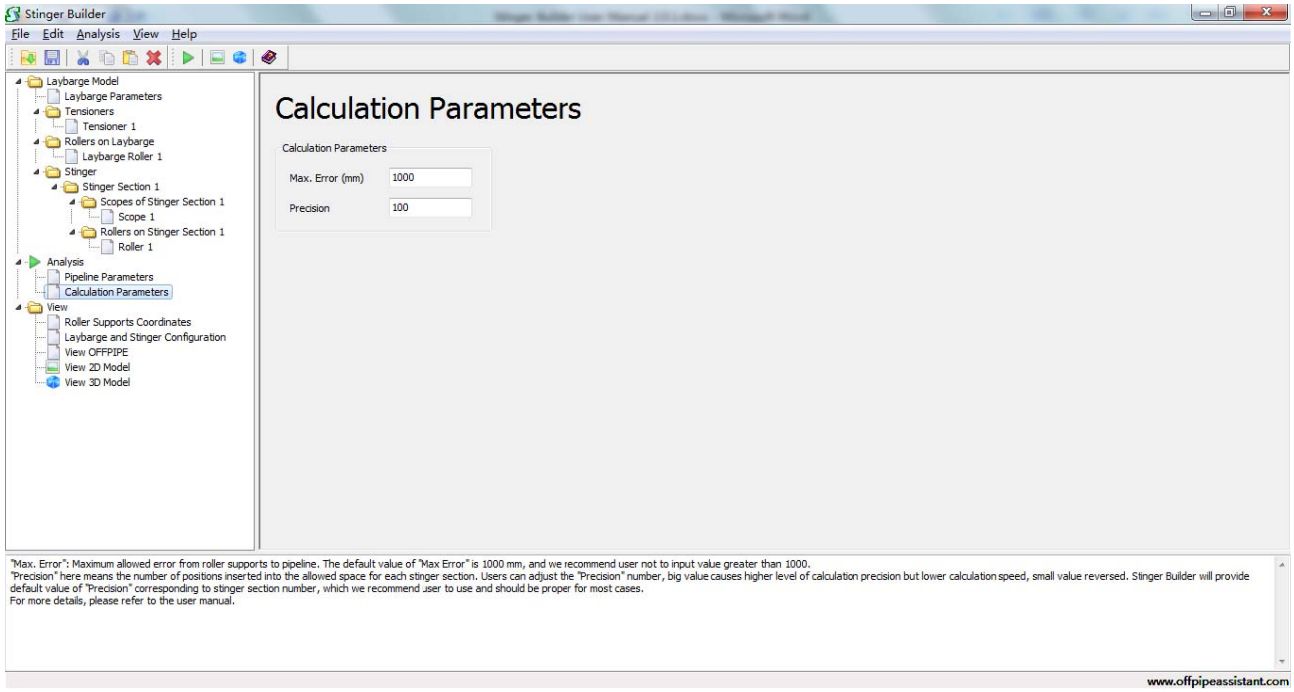

Fig. 3.20 Input calculation parameters

In which:

“Max. Error”: Maximum allowed error from roller supports to pipeline. If user can allow some little errors, a “Max Error” value should be specified. When Stinger Builder™ can not generate a laybarge and stinger configuration by the given pipeline bending radius, it will try to increase the maximum height and decrease the minimum height of laybarge and stinger

rollers temporarily by 0.1 mm, which will be tried again and again if laybarge and stinger configuration still can not be generated, until a result can be generated or the increase exceeds the “Max Error”. However, when output result, all the roller heights are still limited in original roller height scope, which may causes separation between roller supports and pipeline, which is the “error”. **The default value of “Max Error” is 1000 mm, and we recommend user not to input value greater than 1000.** User can specify whether to allow a certain roller support to increase its height range to conduct next calculation when no result can be generated by specify “Yes” or “No” to “Adjust” term of the roller support.

“Precision”: Usually, there are several solutions for laybarge and stinger configuration with the same pipeline bending radius. Stinger Builder™ tries to find the best result in which the Y coordinates of last stinger roller is lowest. The program tries to insert several positions into the allowed space in which the stinger section may be, and then calculate the laybarge and stinger configuration in all the positions. At last, a best result will be found out. “Precision” here means the number of positions inserted into the allowed space for each stinger section. If there are 3 stinger sections, the “Precision” is 20, then the program will calculate for 20^3 times to choose the best result. Users can adjust the “Precision” number, big value causes higher level of calculation precision but lower calculation speed, small value reversed. **Stinger Builder™ will provide default value of “Precision” corresponding to stinger section number, which we recommend user to use and should be proper for most cases.** When user try to find whether a pipeline radius can be generated, then he can use a small “Precision” value, which may not be more than 20 or 30. When user knows that a result can be generated with a pipeline radius, and he want to obtain more precise value, then he can use a bigger “Precision” value, such as 100, even this may cost more calculation time.

3. View the result

(1) Click “View” in the tree view, and select what you want to view, or just click following nodes in the tree view.

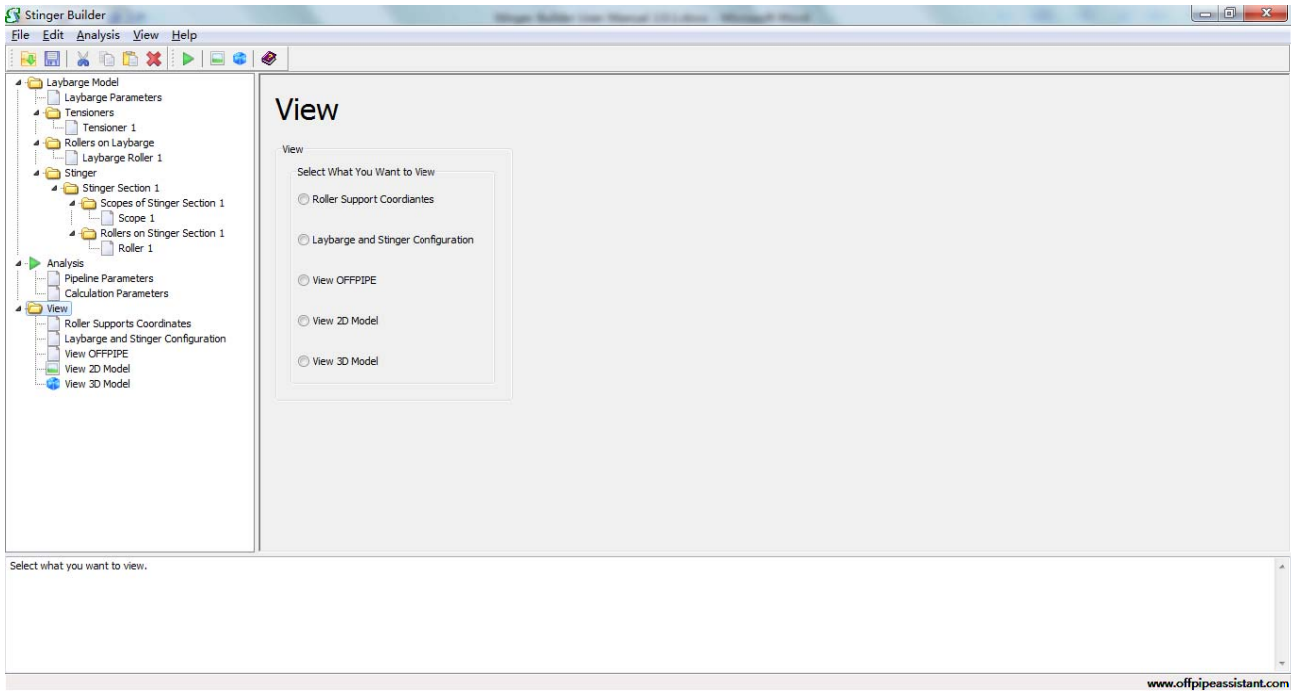

Fig. 3.21 Select what you want to view

(2) Click “Roller Supports Coordinates” in the tree view to view support roller coordinates.

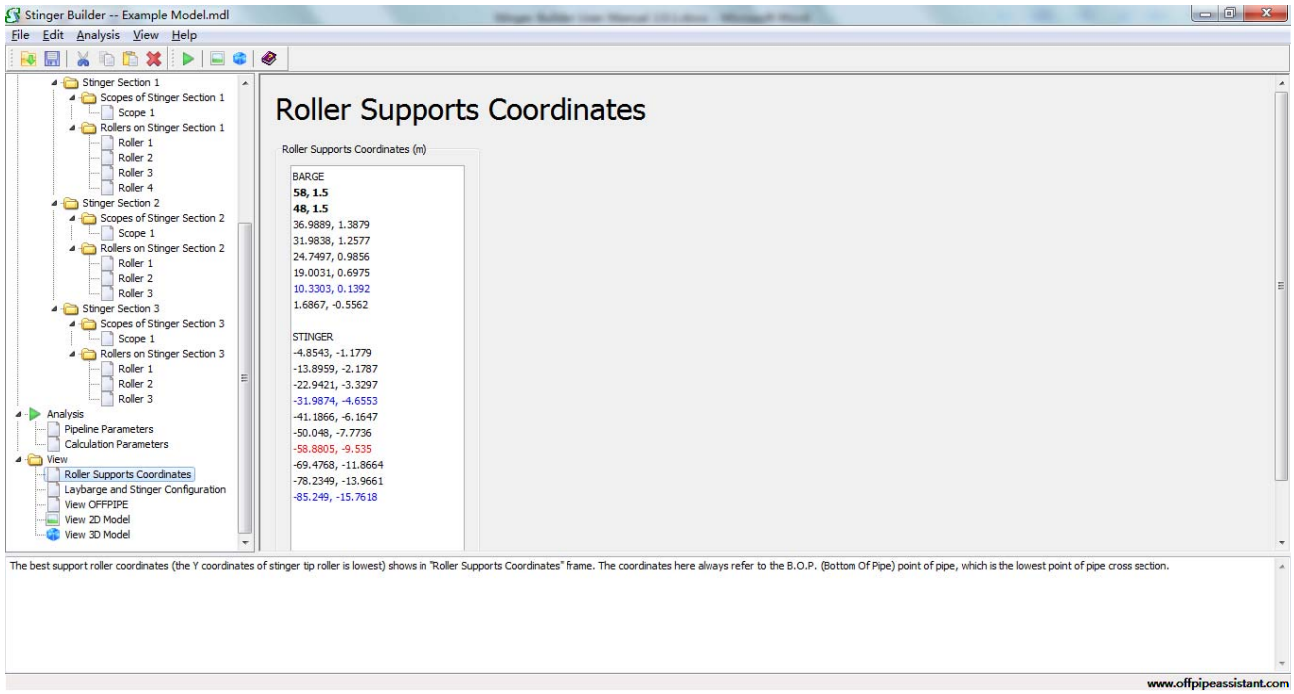

Fig. 3.22 View roller supports coordinates

If the analysis has been run to generate best support roller coordinates (the Y coordinates of stinger tip roller is lowest). The result will show in “Roller Supports Coordinates” frame. The coordinates here always refer to the B.O.P. (Bottom Of Pipe) point of pipe, which is the lowest point of pipe cross section.

(3) Click “Laybarge and Stinger Configuration” to view it.

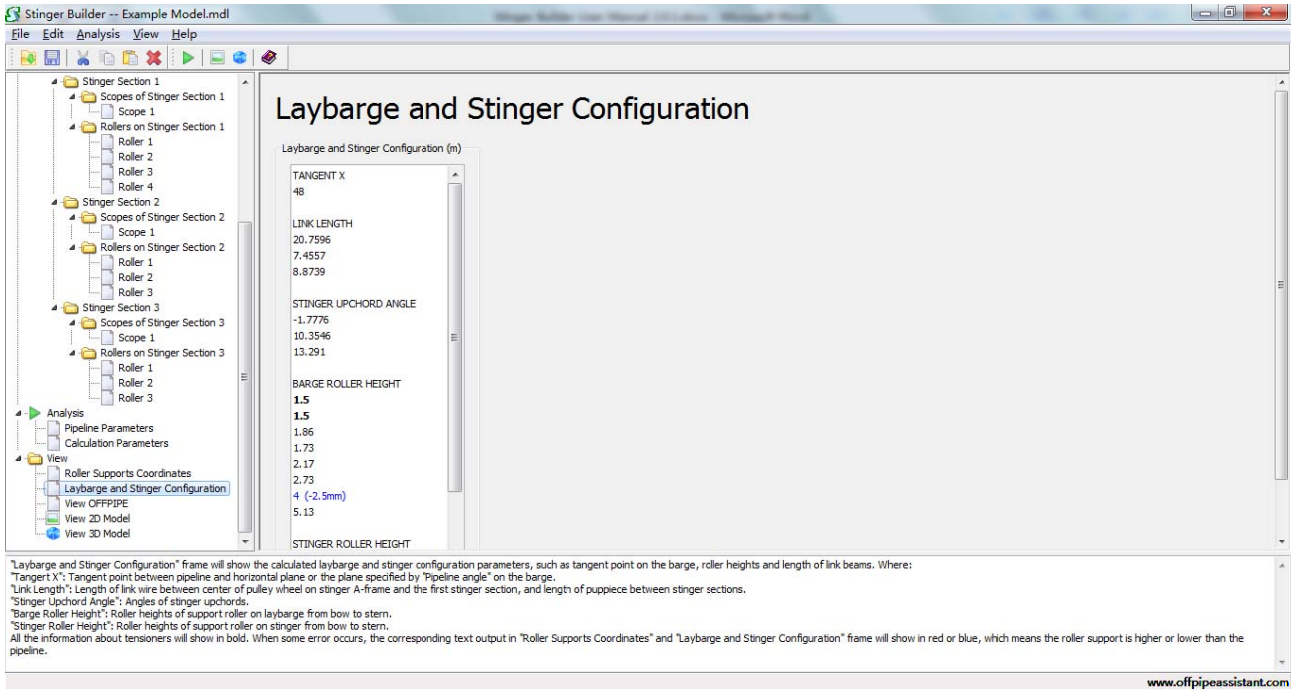

Fig. 3.23 View laybarge and stinger configuration

“Laybarge and Stinger Configuration” frame will show the calculated laybarge and stinger configuration parameters, such as tangent point on the barge, roller heights and length of link beams. Where:

“Tangert X”: Tangent point between pipeline and horizontal plane or the plane specified by “Pipeline angle” on the barge, unit is meter.

“Link Length”: Length of link wire between center of pulley wheel on stinger A-frame and the first stinger section, and length of puppiece between stinger sections, unit is meter.

“Stinger Upchord Angle”: Angles of stinger upchords, unit is degree.

“Barge Roller Height”: Roller heights of support roller on laybarge from bow to stern, unit is meter.

“Stinger Roller Height”: Roller heights of support roller on stinger from bow to stern, unit is meter.

All the information about tensioners will show in bold. When some error occurs, the corresponding text output in “Roller Supports Coordinates” and “Laybarge and Stinger Configuration” frame will show in red or blue, which means the roller support is higher or lower than the pipeline, and “Laybarge and Stinger Configuration” frame will show the separation between roller supports and pipeline.

Both “Roller Supports Coordinates” and “Laybarge and Stinger Configuration” frame will show fault messages if the increased error exceeds the “Max Error” and Stinger Builder™

can not generate a laybarge and stinger configuration by the given pipeline bending radius within the max allowed error.

(4) Click “View OFFPIPE” to view the calculation result in OFFPIPE format. By Clicking “Consider Roller Length” Checkbox, user can insert roller support length definition into the OFFPIPE format text. User can copy the text directly to OFFPIPE input file for analysis.

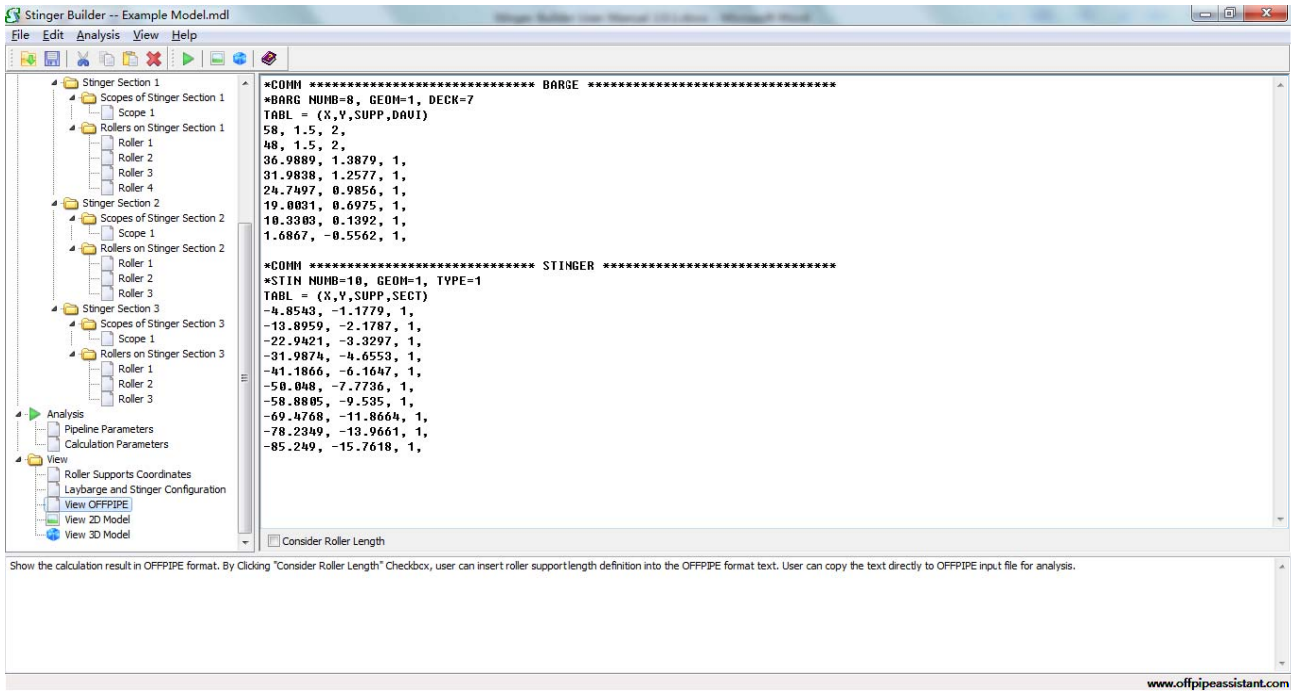

Fig. 3.24 View OFFPIPE

(5) Click “View 2D Model” to view the calculated profile of pipeline and stinger. Click “Save Picture” button to save the picture as Windows metafile.

(6) Click “View 3D Model” to view 3D model of calculated profile of pipeline and stinger. In the 3D model window, “Roller State” checkbox is used to control whether to show roller support errors. When the roller support is higher than pipeline, it shows red, when lower, shows blue, when the pipeline B.O.P. is within the roller support adjustable range, the support shows green.

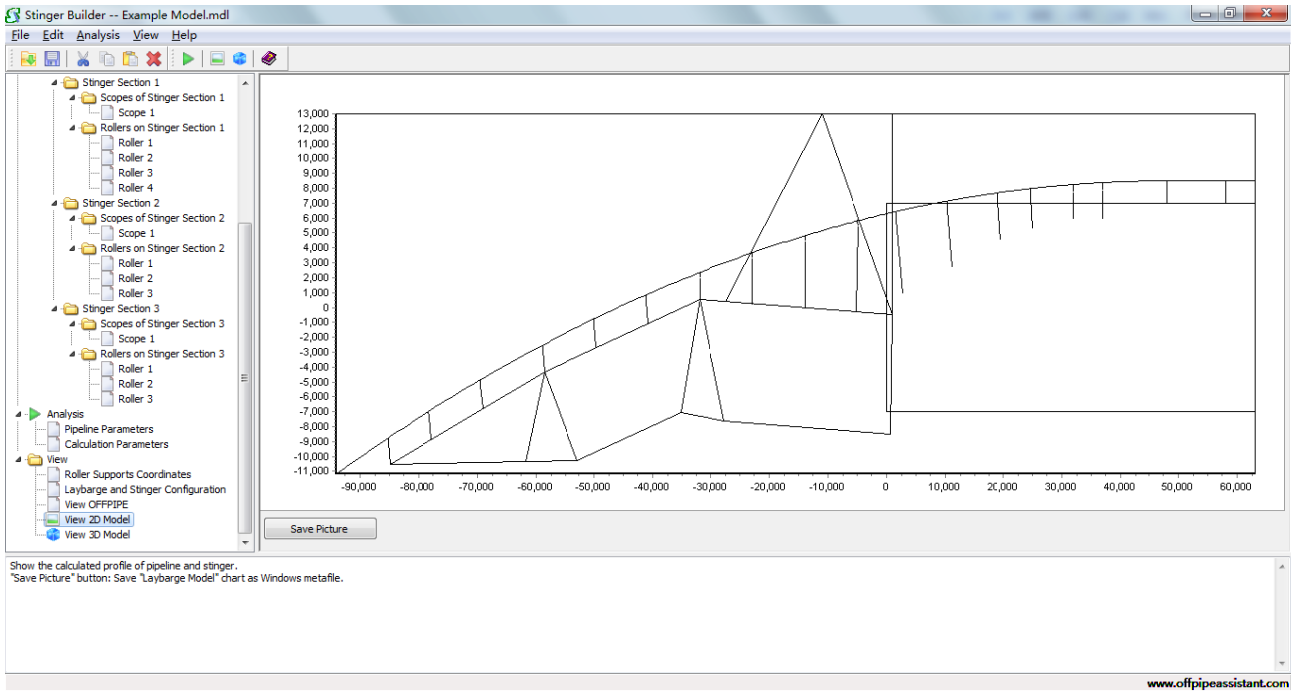

Fig. 3.25 View 2D Model

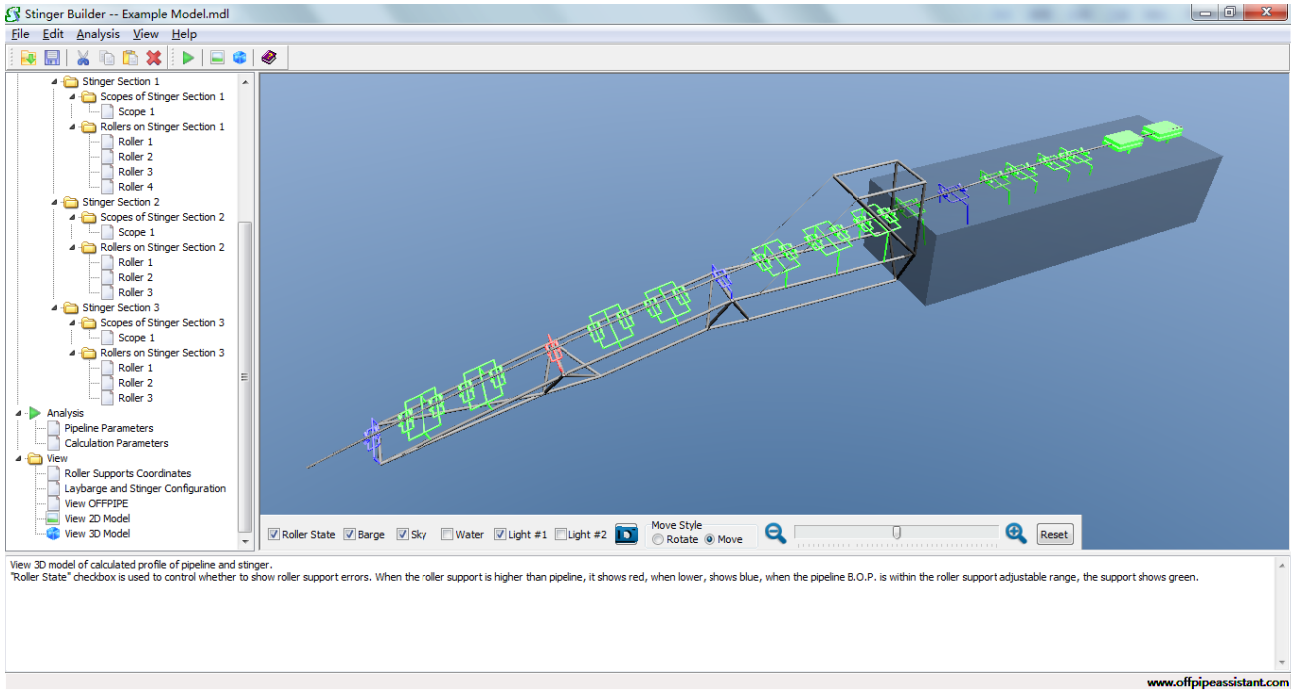

Fig. 3.26 View 3D Model

Some functions in the tree view can be directly conducted from main menu and tool buttons. Just try it by yourself.

What need to be emphasized again is that Stinger Builder™ is used to build laybarge and stinger model for OFFPIPE Assistant™, only the parameters in “Laybarge Model” part will be save in laybarge model file to be called by OFFPIPE Assistant™. All the parameters in

“Analysis” part and all the output in “View” part are used to test the model and will be ignored by OFFPIPE Assistant™ automatically.

4 FAULT MESSAGES & NOTES

Some fault messages may be encountered by users are listed below:

1. A message window as Fig. 4.1 shows.

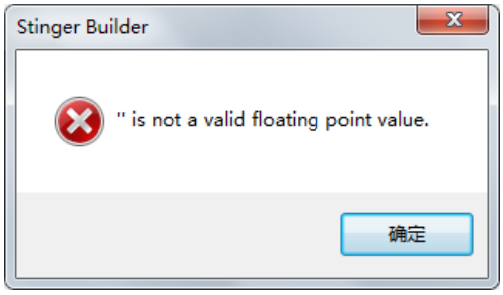

Fig. 4.1 Fault message window

How to solve: Make sure to fill all the blank comboboxes and edits before clicking “Calculate” button.

2. Software can not be started or run.

How to solve: Please insert the attached hard lock into one of USB port in your PC.

5 TECHNICAL SUPPORT & AUTHORIZATION

For technical support and authorization of Stinger Builder™, please visit:

http://www.offpipeassistant.com

or contact:

support@offpipeassistant.com