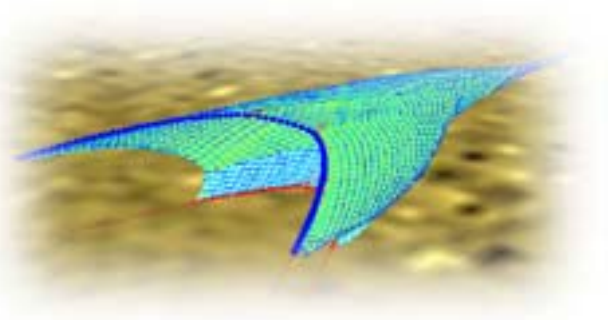
Exercises DynamiT



# DynamiT

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## Training exercises for new users

3 How to define a proper virtual trawl and run a simulation

This tutorial shows step by step how to define an efficient virtual trawl (numerical mesh) and run a simulation. We suppose the tutorial “Bottom Trawl” has been understood and we start with the TRG file resulting from this tutorial.



➢ Some action to exert on the software

Something to remember

## 1.1 Defining the numerical meshing

The simulation calculations do not apply directly to the physical aspects of the trawl gear but on a series of constituents which discretize[1] the trawl gear (a numerical model of the trawl gear or a virtual trawl gear). From the data entered up to now several different models can be processed. Each model is characterised by its )fineness.

- Change to mode « Numerical mesh ».
- Note that each panel or each piece of netting has been meshed and that the links between the panels and the rig have been processed.
- Check the symmetry of the links between rig and net.
- Choose option « intermediate knots on the strengthening ropes » in menu « file / properties » (this is a necessary step for rough meshing as it is the case here, but not for finer meshing).

DynamiT processes automatically a meshing by default taking for reference the first netting section of each panel : this first netting section comprises a single mesh in height.

This meshing by default can be modified so as to optimise the simulation processing (speed and accuracy).

- Double click on the meshing to be modified.

The dialog box « panel » appears.

- In the contextual help read the meaning of each parameter.
- Try to modify the parameters of each tab and observe the relevant effect on the meshing to understand their meaning.
- Add a transition.

The parameters of a « proper meshing » have to respect 6 conditions:

- **A representative model of the net** :
  - C1 : at least one mesh in the cod-end width,
  - C2 : at least two meshes in the wings width,
  - C3 : extend the corners of the square by a bar line.
- **Optimising the calculation** :
  - C4 : smaller a bar, at least 0.1 m in practice,
  - C5 : reasonable quantity of bars (1000 to 6000),
  - C6 : one intermediate knot on each mesh side.

[1] To descretize (a trawl gear) is to replace something continuous (nets, cables …) by a finite series of values (nodes and bars). Calculation can only be carried out on a discretized trawl gear.

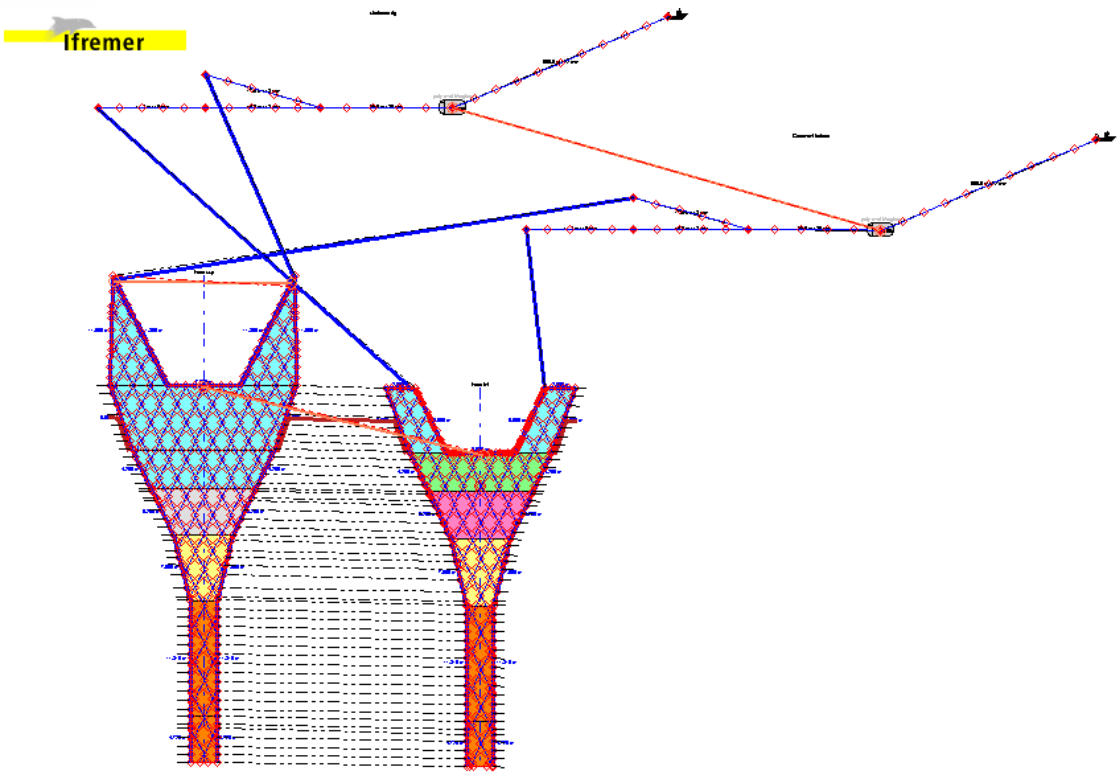
- Modify the parameters to obtain the smallest bar as long as possible and respect the criteria towards a proper meshing which must contain at least 1000 bars. The main parameters are found in « numerical mesh side » and « first vertex position » of tab « globalization parameters ».

A solution is given hereafter (it is not the only one !) :

For the upper panel the following parameters can be used :
Numerical mesh side : 2 m
First vertex position : -10.71 m

For the lower panel the following parameters can be used :
Numerical mesh side : 2 m
First vertex position : -9.49 m

This does result in a meshing line in the continuation of the wings, in a smaller bar around 10 cm long and in 978 bars.



## *1.2 Simulating the trawl gear*

- Calculate the globalization (button « Globalization »).
- Notice the data delivered on the numerical meshing, mainly that related to the number of bars and nodes.
- Press the 3D key to change to simulation mode (SIM file).
- Give a name to the SIM file (usually, the name given by default suits).

### 1.2.1 Choosing the simulation parameters

- Press the « start » button.
- Choose the speed and the depth (3.5 knot, 150 m).
- Choose the angle of the initial shape equal to –1.
- Refer to on-line help (F1) for the meaning of each parameter.

Generally, the parameters of tab « calculation » are values given by default, which comply with most of the simulations.

- Validate the choices to start the simulation.

- Notice the initial shape of the gear trawl, in connection with the initial warps angle.
- Read on-line help related to the meaning of the output of the bottom panel (Information – simulation output).
- After a few seconds simulation unroll the pictures given in the left column.
- Save the file ; notice the change in the pictures icons (grey to black)

Notice you can save a lot of calculation time if you replace “information output period” (default value : 50 / iteration) by 500. In fact, DynamiT calculation is not faster but the Windows system is less busy.

- « Move around the 3D picture » (shift, zoom …), refer to on-line help.
- For instance, represent the trawl as a « facet » view or as a « wire » frame so as to appreciate the volumes and stresses.
- Notice the elongation of the warps, is it realistic ?

### 1.2.2 Display the main results

- Hit the key C (as calculation).
- Hit the key O (as Output calculation).
- Hit the key C again.

If you have properly defined the distances you wanted to display during the simulation, the openings and tensions are automatically displayed.

Wait until the calculation convergence has occurred (automatic stop).

The following values are obtained at convergence after about 4 minutes of calculation (1800 MHz PC) :

*Trawler speed / Heading : 3.50 knots / 0 °*
*Bottom depth / Friction coefficient : -150.0 m / 0.60*
*Number of bars / nodes : 946 / 731*
*Minimum / maximum tension : -387.1 KgF / 2591.5 KgF*
*Vertical opening: 2.8 m*
*Horizontal opening: 16.7 m*
*Otter boards opening: 61.0 m*
*Warp tension / total towing traction Z (kgF) : 2591.5 2591.4 / 4842.1*
*Projected swept surface (m²) : 35.8 Swept water volume per second (m3/s) : 64.3*