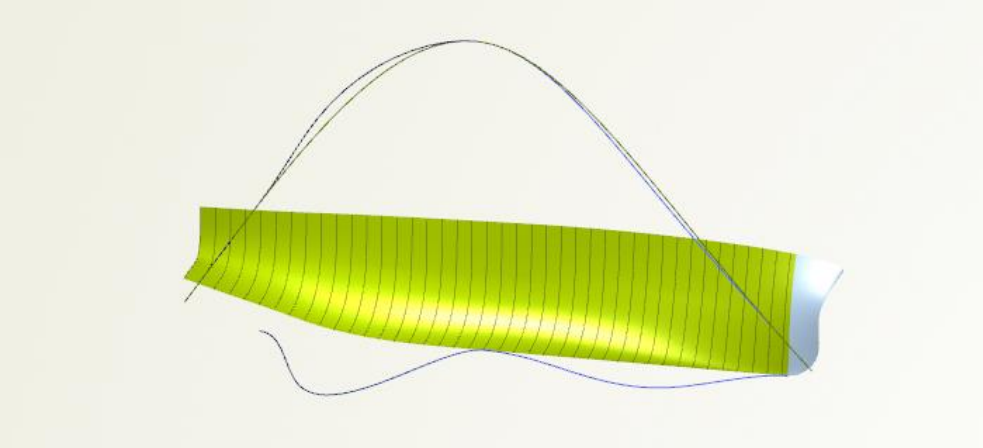
Lackenby Hull Variation

In this tutorial you will learn how to apply a *Generalized Lackenby Shift* to an existing geometry. From an example surface including hydrostatic analysis, the sectional area curve of the hull is varied via the Lackenby shift function. The *Generalized Lackenby* moves the shape in forward and backward direction according to some user-defined and hull-relevant settings such as the change of displacement and the change of center of buoyancy. It requires an initial sectional area curve, values for *Lpp* as well as a range in which the shift shall be applied.



See also the previous tutorial “Hull Variation” for more information about the concept of shift functions.

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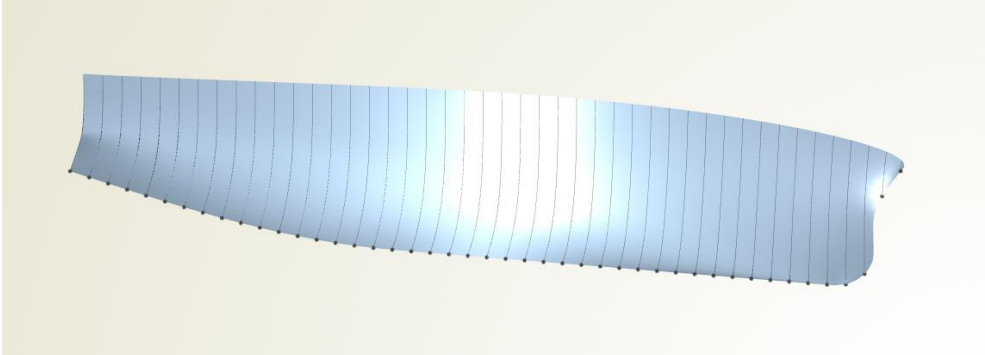
The resulting setup can also be found in the section *samples* > *tutorials* of the documentation browser.

1 Initial Geometry

The steps are based on the hydrostatic tutorial from the hull design section:

- Choose *file > open sample > tutorials > 61_Hydrostatic_Calculation.fdb*.
- Select the main surface and rename it to “main”.
- Select the stem surface and rename it to “stem”.

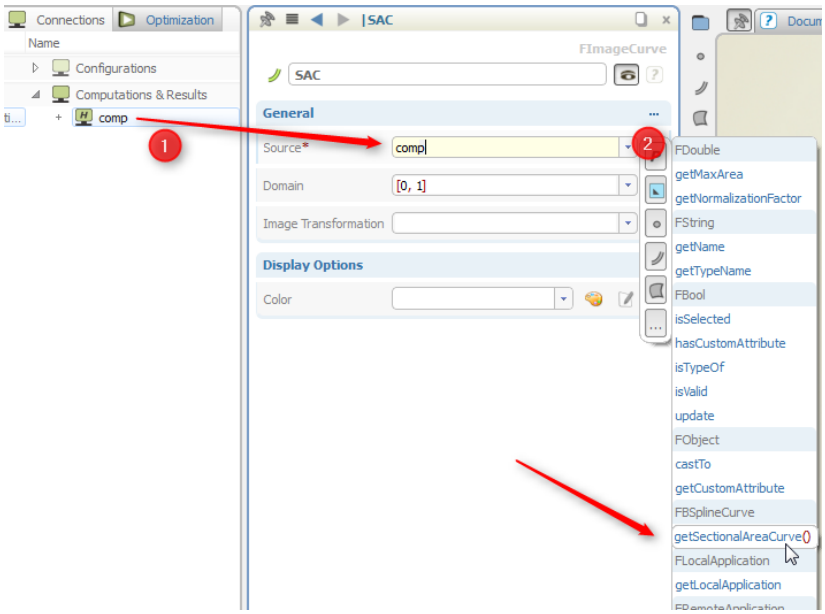
✓ We change the names only for better readability later on.



2 Sectional Area Curve (SAC)

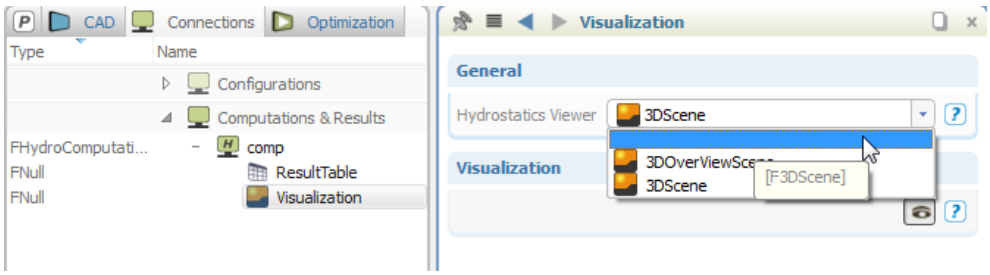
The sectional area curve is one output of the hydrostatic calculation. Let's put it into an image curve to have it available as a simple reference in the tree. We can then in the next step nicely compare it with the new sectional area curve that is generated by the Lackenby shift.

- Create an image curve via *CAD > curves > image curve* and name it "SAC".
- Drag & drop the hydrostatic computation "comp" into the *source* attribute.
- Use auto-completion (CTRL+SPACE or the button next to the source editor) to select the command *getSectionalAreaCurve().*



Switch off the hydrostatic visualization since we do not need it for the time being:

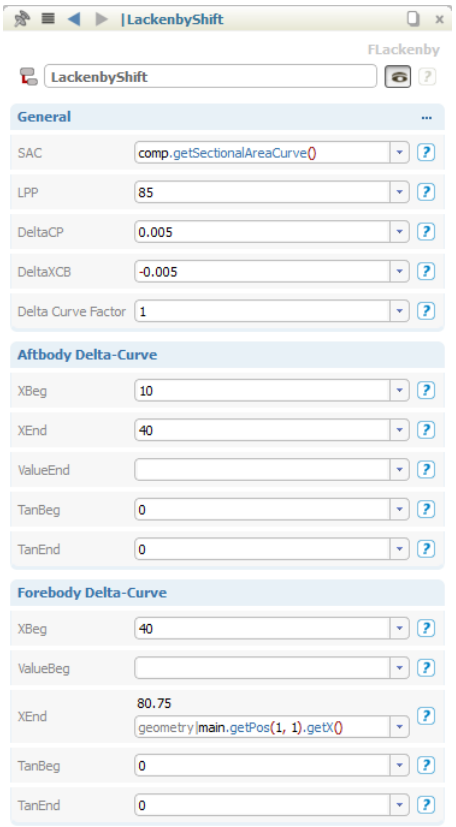
- Select the visualization result of "comp" and deselect the viewer (i.e. no selection, empty).



3 Generalized Lackenby

The *Generalized Lackenby* is the object that calculates delta shift functions that satisfy a set of constraints. The constraints are values for change of displacement, change of center of buoyancy, but also start and end positions including tangent settings for the internal delta curves.

- Create a Lackenby shift via *CAD > transformations > shifts > Lackenby* and name it "LackenbyShift".
- Enter "comp.getSectionAreaCurve()" into the attribute *SAC* of the Lackenby object.
- Set the remaining values according to the screenshot.



Note that the shift for the forward part is supposed to be defined from 40m up to the end of the surface "main". The surface "stem" should remain unchanged:

- Drag & drop "main" into the attribute *XEnd* and use auto-completion to receive a forward coordinate of a surface position via "geometry|main.getPos(1,1).get(X)".

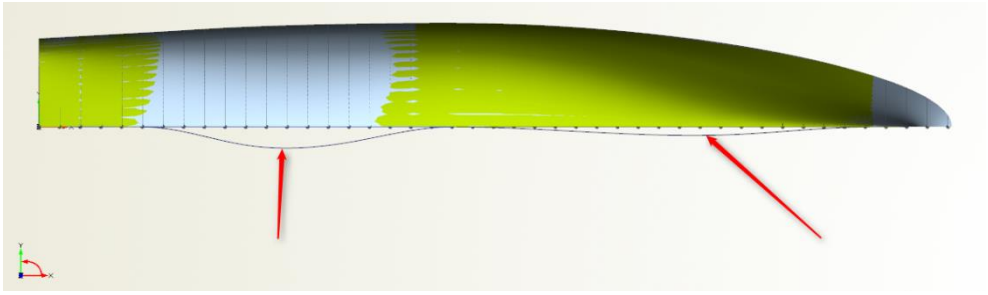
The 3D view now visualizes the resulting sectional area curve as a result of these settings. The Lackenby internally generates delta shift curves that are also visualized in the xy-view.

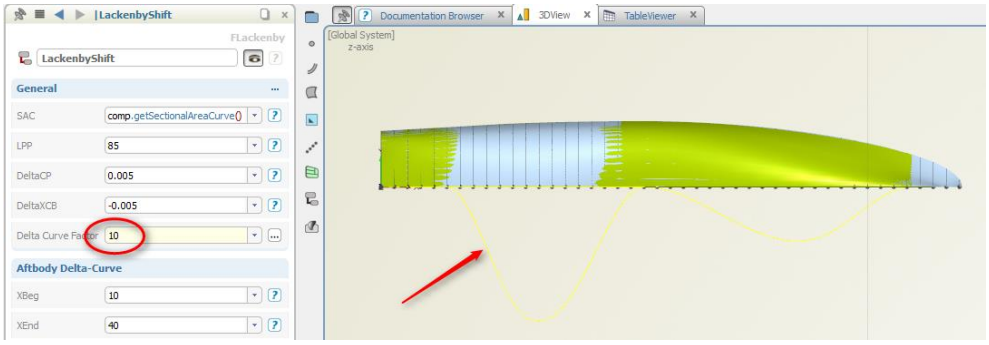
✓ The *SAC* attribute expects a *b-spline* curve as input which is what gets returned by the hydrostatic calculation.

4 Image Surface

We need to apply the Lackenby shift transformation to the initial surface. In this step, the transformation and the surface are put together:

- Choose *CAD > surfaces > image surface* and name the image “newhull”.
- Set “main” as *source* input for “newhull”.
- Set “LackenbyShift” as input for the attribute *image transformation*.





✓ The 3D view shows the new shifted surface (green-yellow) along with the original one. The new vessel is more slender in the forebody part while the aftbody part is fuller. The longitudinal position of the center of buoyancy has moved backwards by 0.5% and the CP value is also changed by 0.5%.

Switch to the xy-view of the 3D window to have a look at the generated delta curves and use the delta curve factor of the Lackenby for visually scaling it.