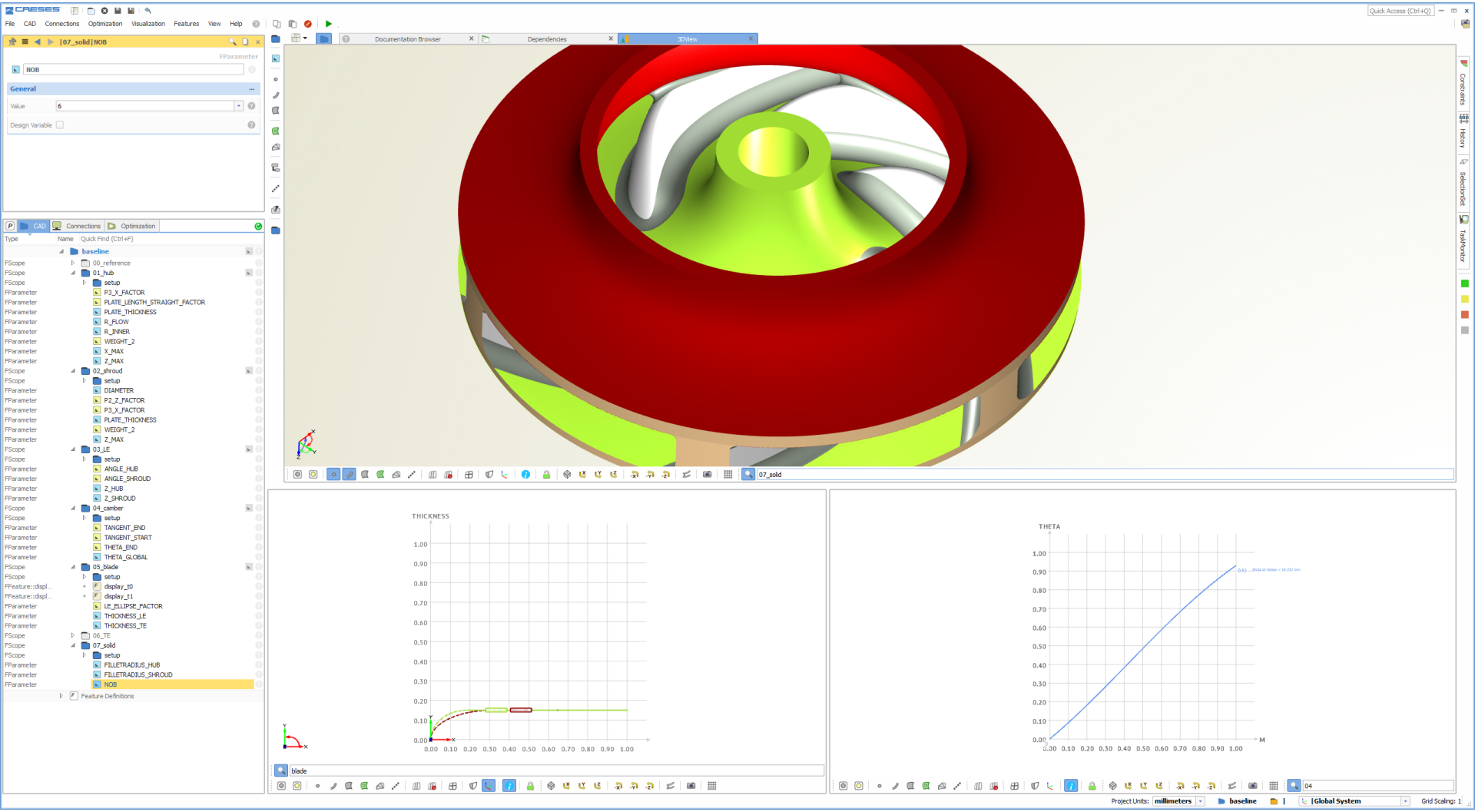
Demo

IMPELLER MODEL March 2017

FRIENDSHIP SYSTEMS

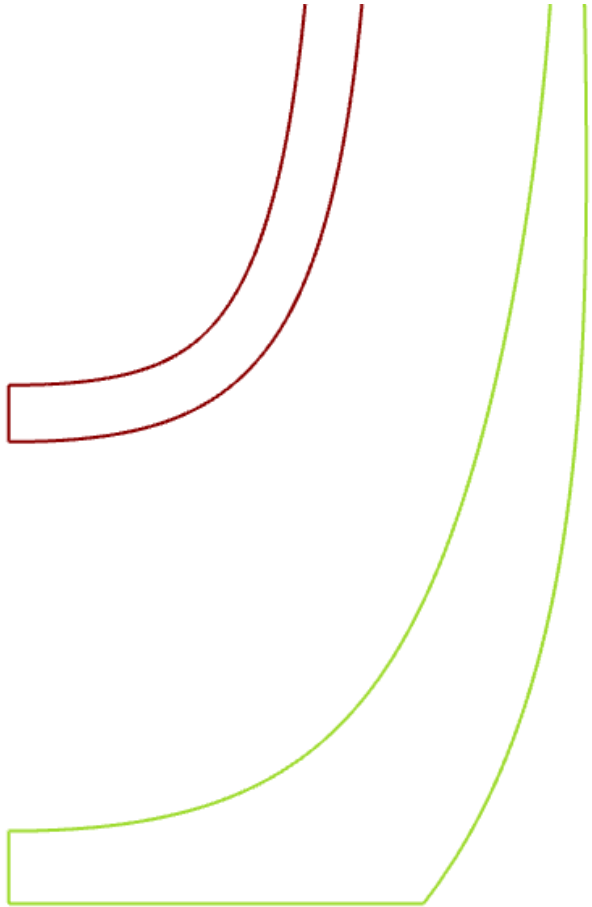


MERIDIONAL CONTOUR

Hub and shroud contours are parametric (variable).

All **PARAMETERS** can be found in the object tree on the left side in CAESES.

- baseline
  - 01_hub
    - setup
    - P3_X_FACTOR
    - PLATE_LENGTH_STRAIGHT_FACTOR
    - PLATE_THICKNESS
    - R_FLOW
    - R_INNER
    - WEIGHT_2
    - X_MAX
    - Z_MAX
  - 02_shroud
    - setup
    - DIAMETER
    - P2_Z_FACTOR
    - P3_X_FACTOR
    - PLATE_THICKNESS
    - WEIGHT_2
    - Z_MAX



These parameters be changed manually, but also

FULLY AUTOMATED.

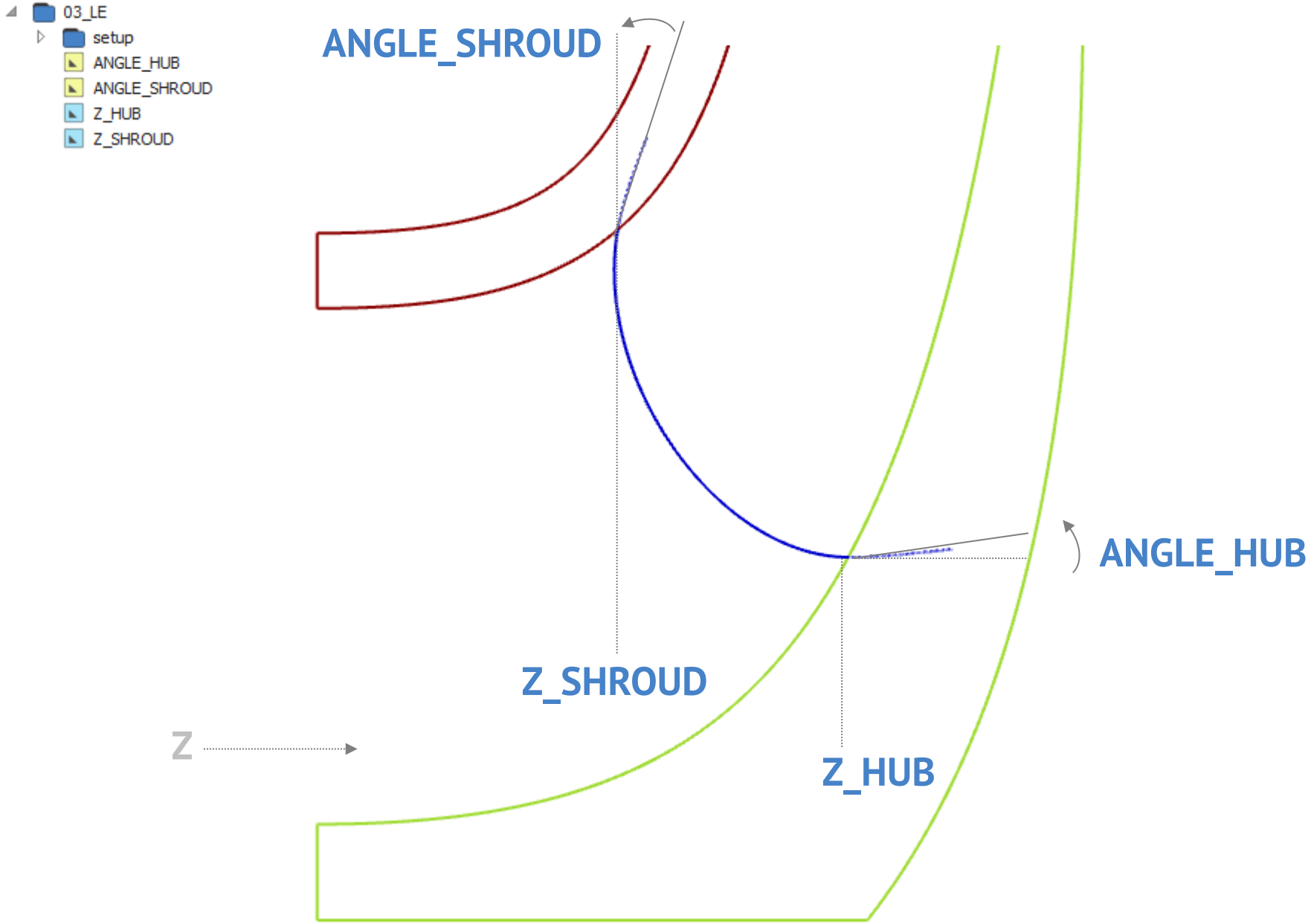
LEADING EDGE

There is a fairness optimized spline for the

LEADING EDGE.

The z-positions of the start and end can be controlled

as well as the two angles ...



CAMBER

There is a single **THETA FUNCTION**

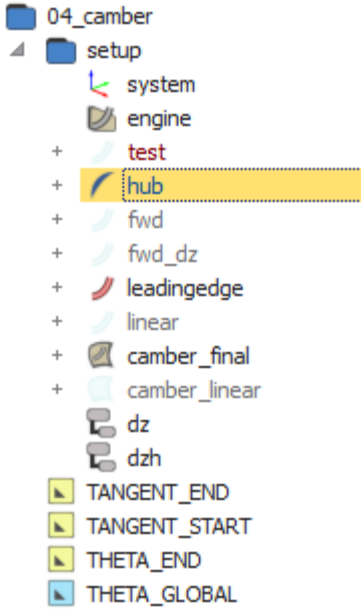
where the start and end values can be controlled

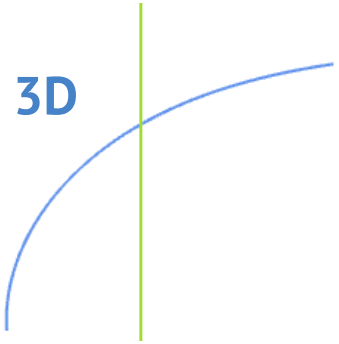
as well as the tangent angles of the theta function

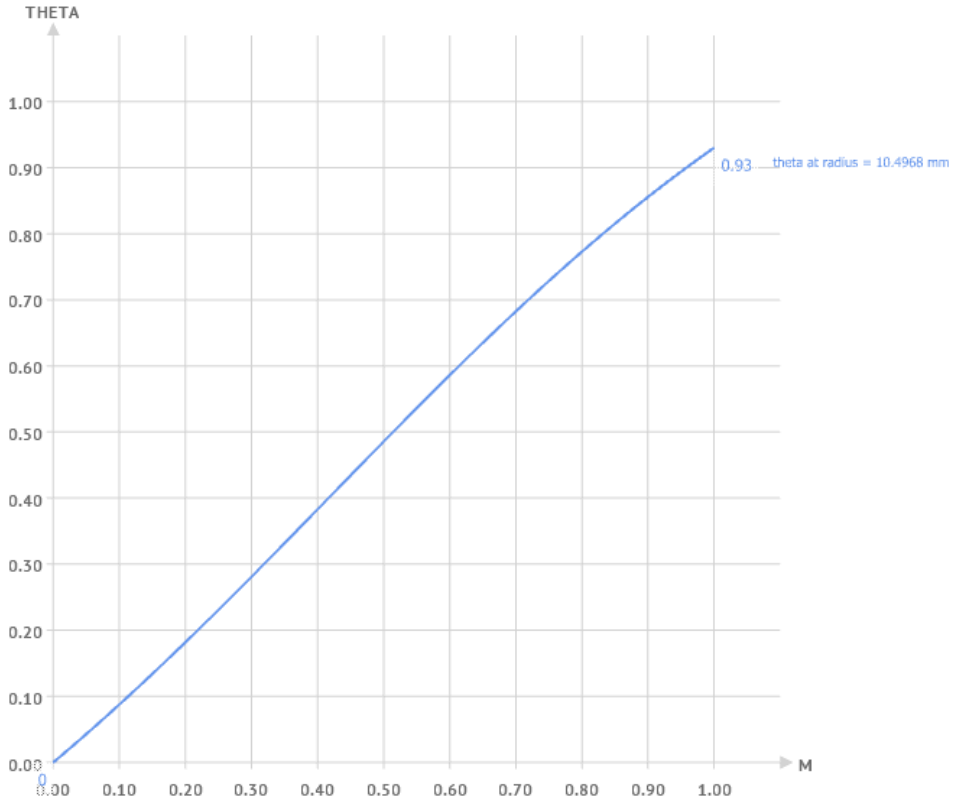
at the start and the end.

BTW:

Theta at start is set to zero - a global theta is applied.

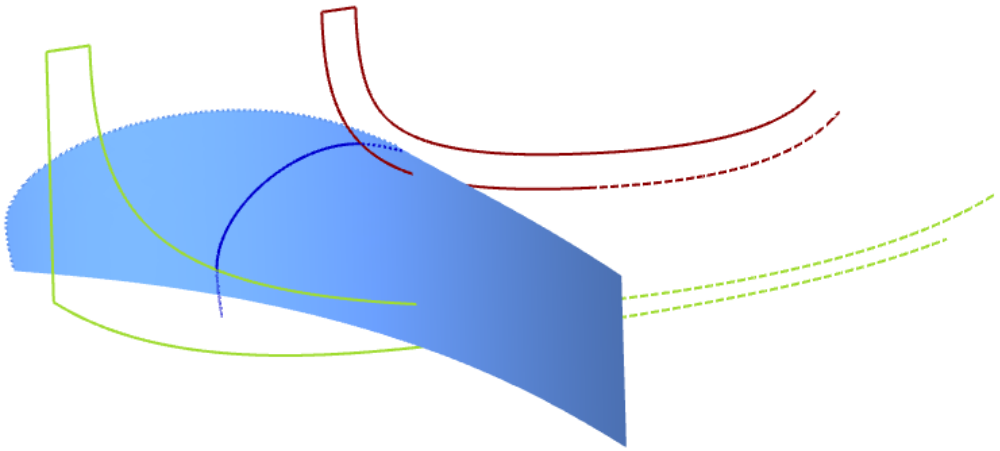






From this theta function and the leading edge contour,

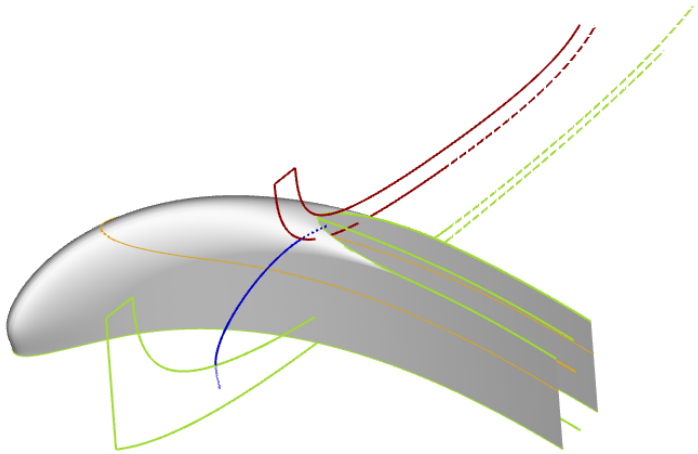
the **CAMBER SURFACE** can be derived.



BLADE

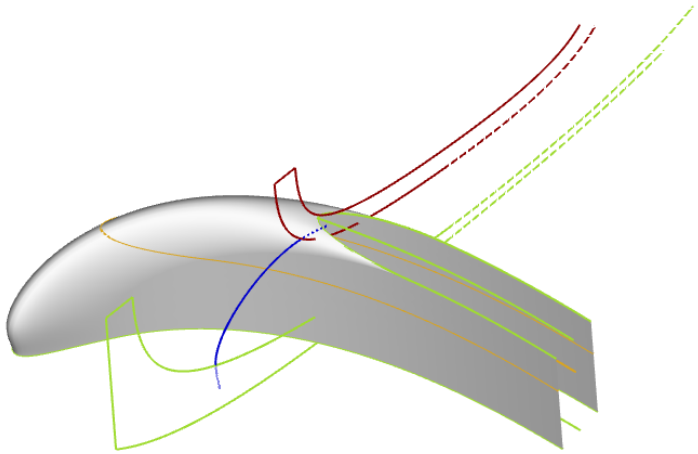
The blade surface is generated from the camber surface

and **THICKNESS PARAMETERS.**

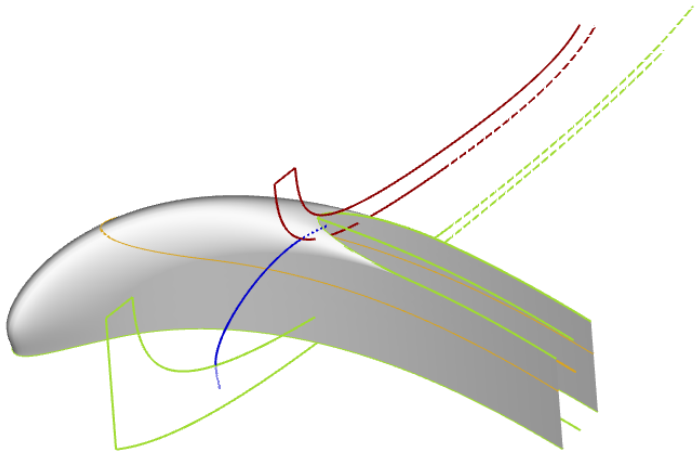


The thickness **CAN BE VARIED**

from hub to shroud!



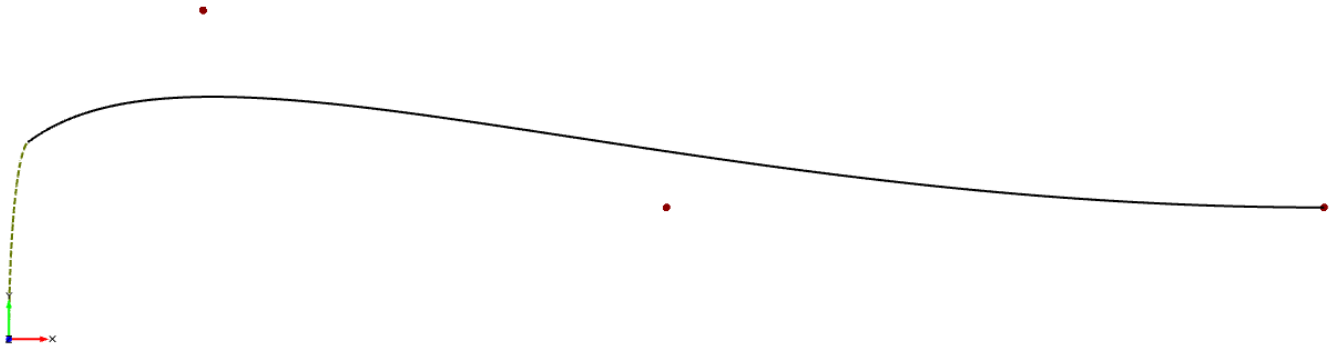
Radial control exists for thickness at leading/trailing edge, leading edge shape and the general thickness function shape for each radial location.



THICKNESS: DETAILS

Thickness function is made of an **ELLIPSE** (LE)

and a **BSPLINE CURVE** with 4 points.



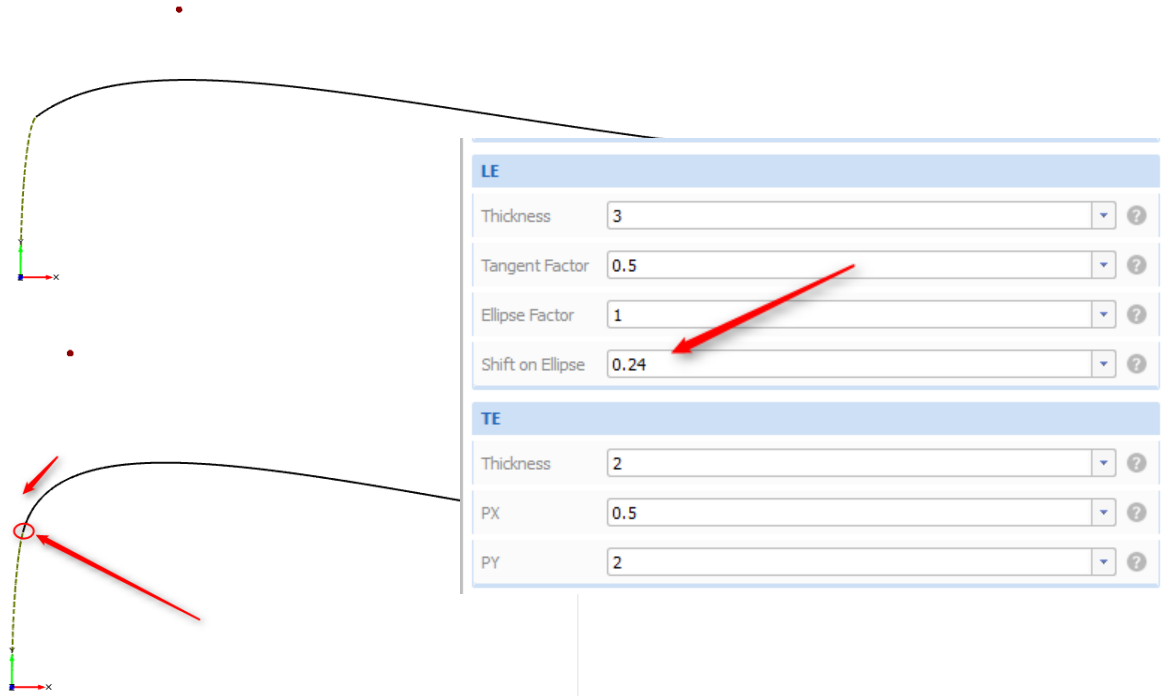
BLEND POSITION (transition LE/Spline)

on the ellipse can be varied by using a

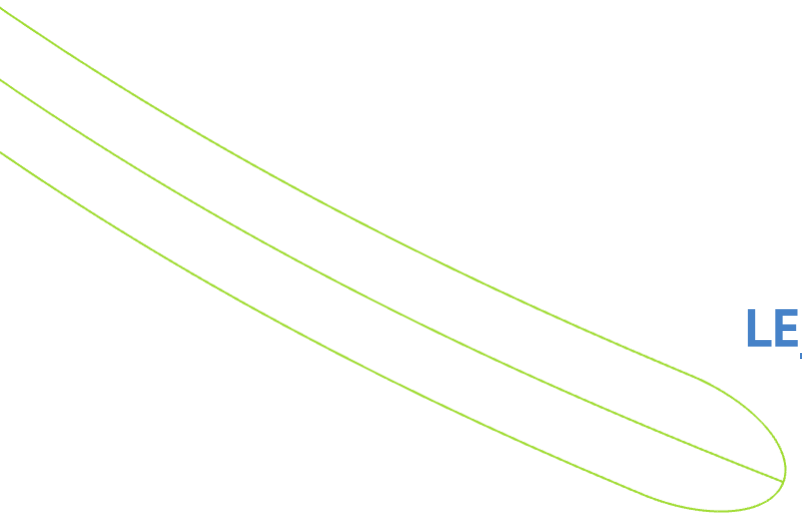
SHIFT PARAMETER.

The parameter runs in the range [0,1].

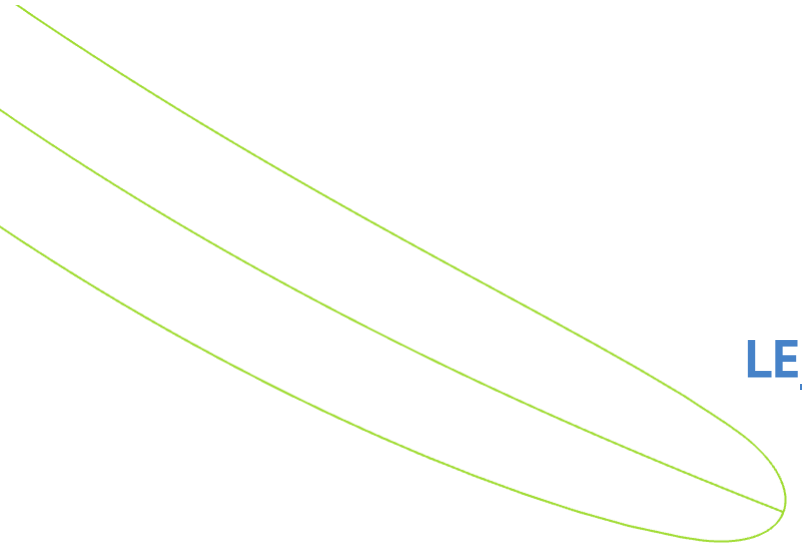
The higher the value, the larger are the blade angle.



Note: Thickness is scaled down for visualization



LE_SHIFT_HUB = 0.0

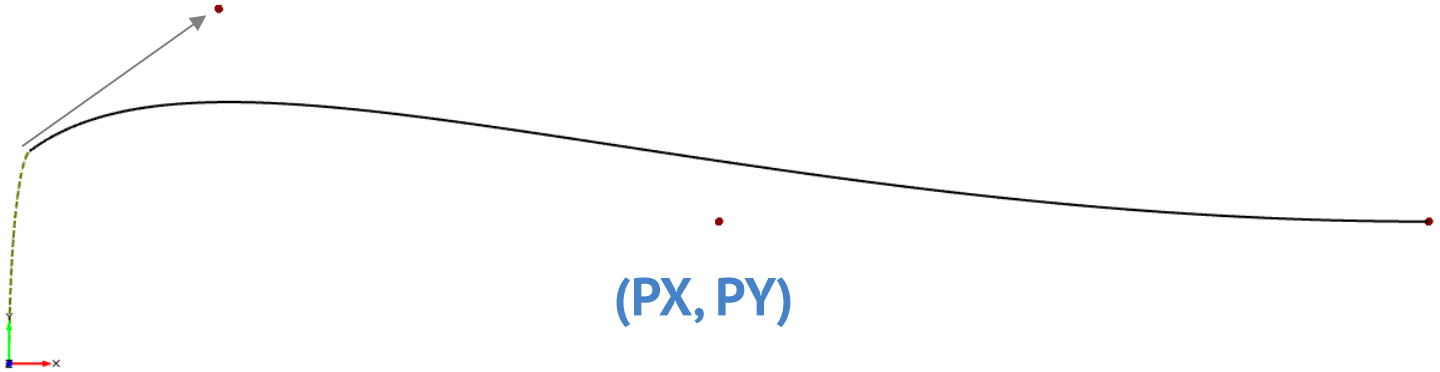


LE_SHIFT_HUB = 0.2

The SPLINE controls ...

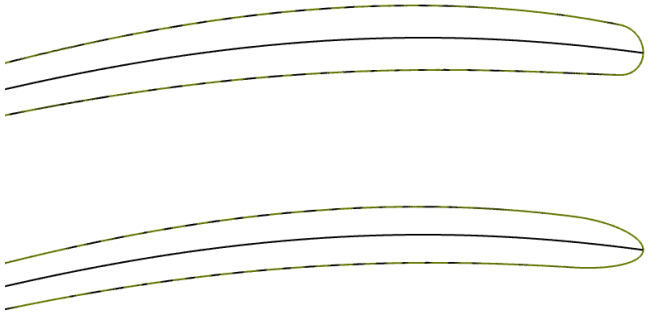
TANGENT FACTOR i.e. strength.

Note that the angle is defined through blend point shift.



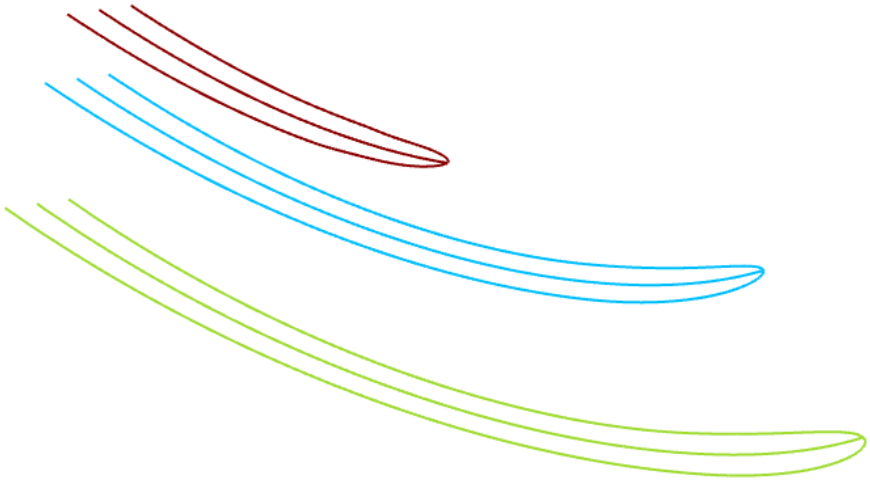
The ELLIPSE FACTOR controls

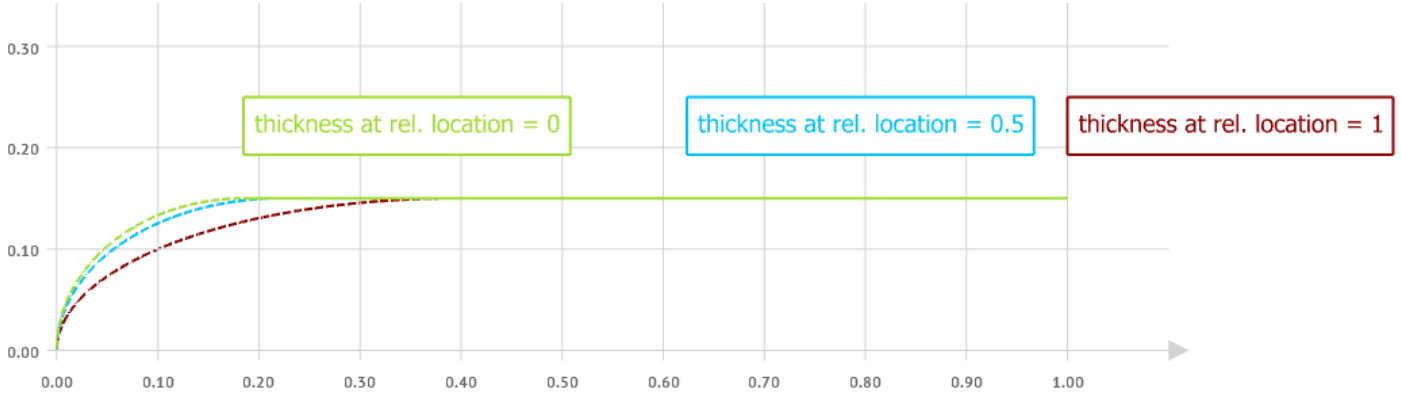
whether to have a circular or ellipse-like LE.



VISUALIZE thickness information

for certain radial locations…

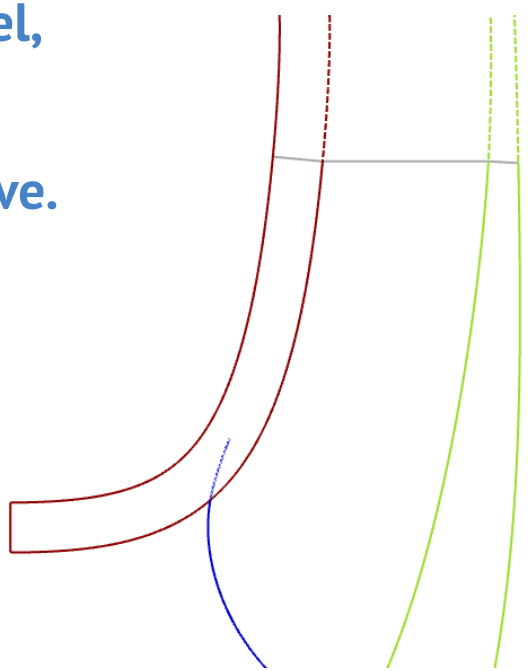




TRAILING EDGE

TE is based on the reference model,

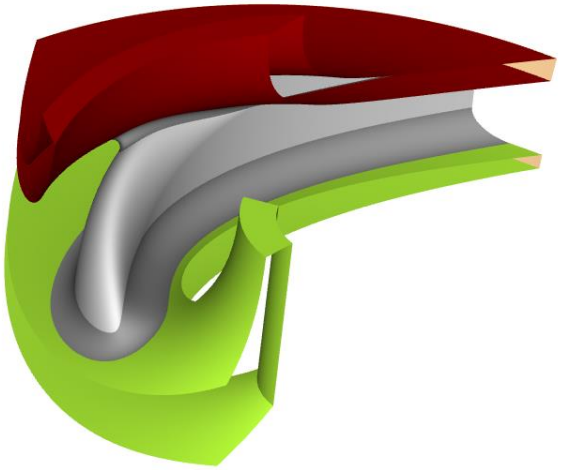
can be ANY KIND of curve.



FINAL IMPELLER

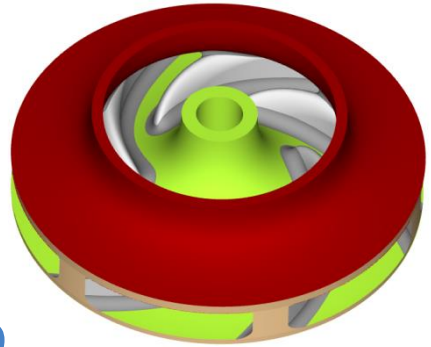
Periodic blade is generated and

ROTATED for the final impeller.



Each relevant patch has a

DIFFERENT COLOR

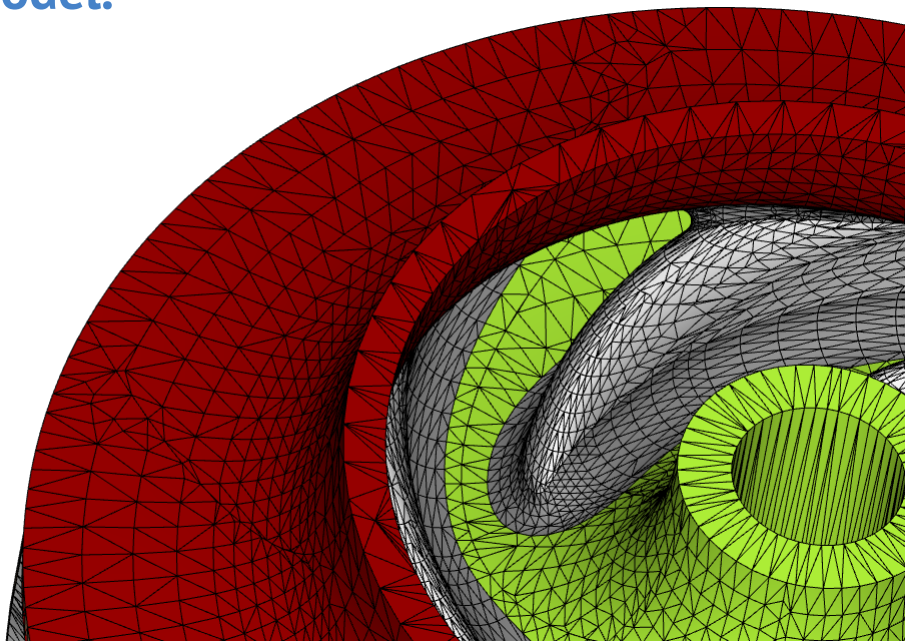


for easier automation of the meshing procedures.

If needed, a **CLOSED** and

COLORED STL

can be exported from this model.



DESIGN STUDY

The model has been tested for

ROBUSTNESS within the

current ranges of the parameters.

CAESES provides strategies for the

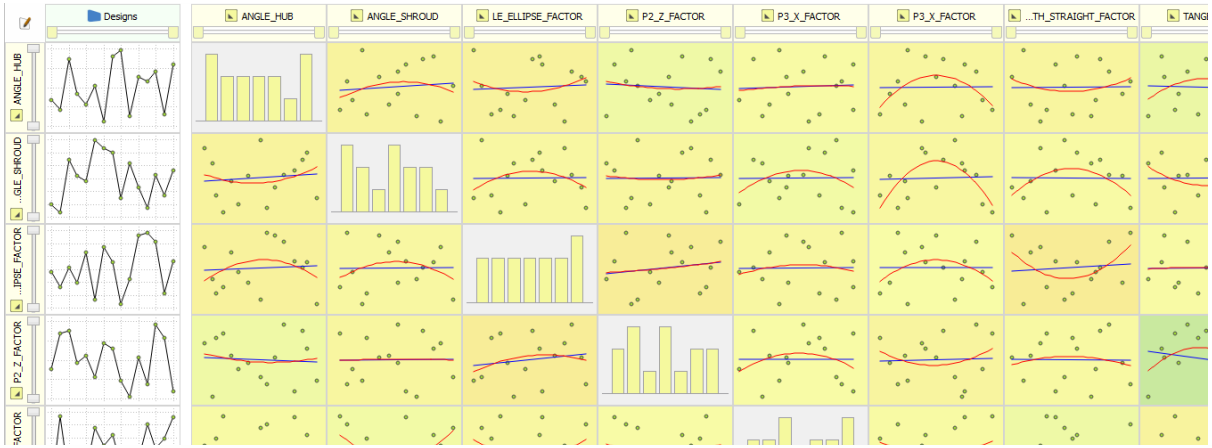
AUTOMATED

VARIANT CREATION.

Here is a picture of the

RESULT TABLE,

and the 2D charts in CAESES ...



Design Viewer | study_1_results | study_2_results

Show Charts

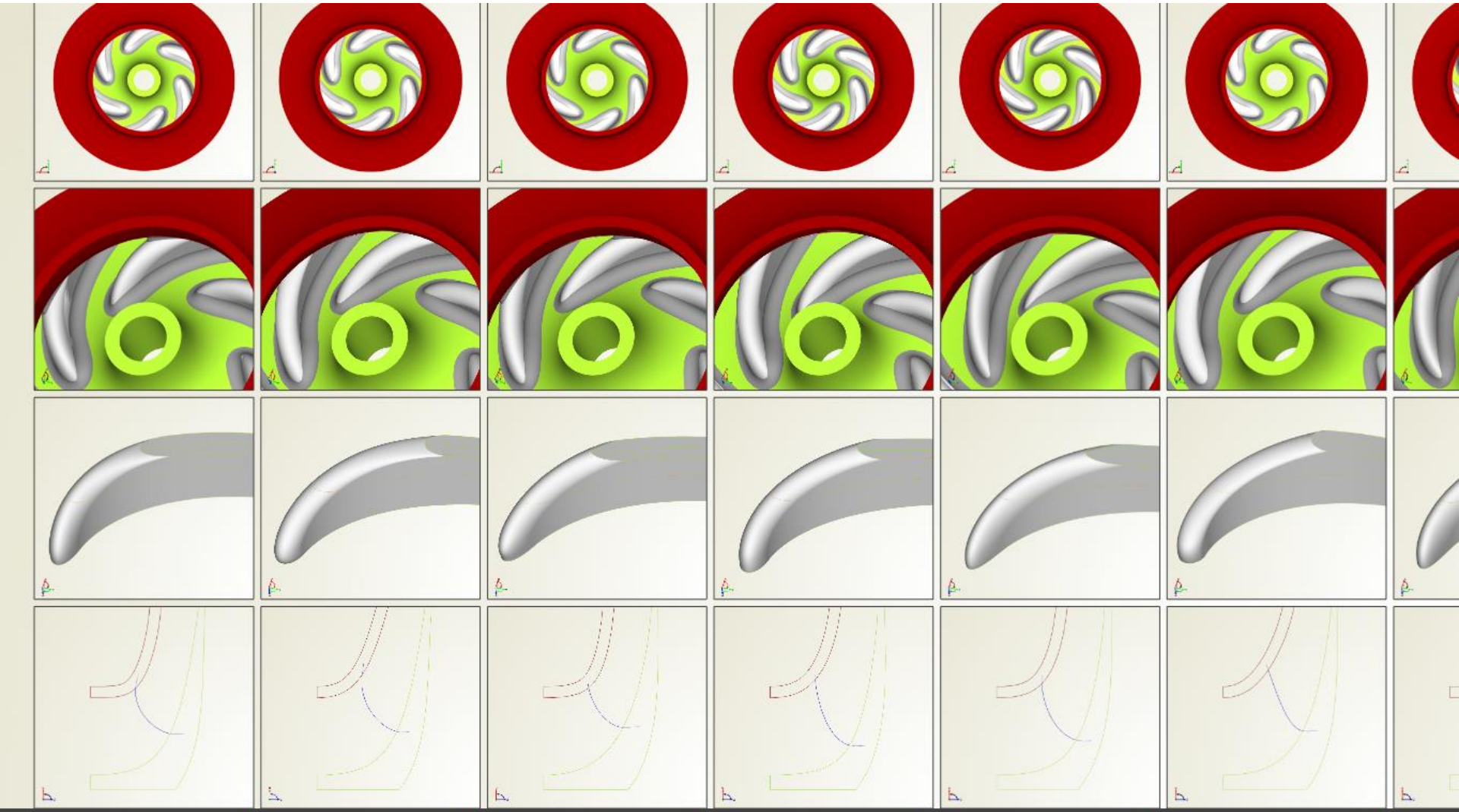
	ANGLE_HUB	ANGLE_SHROUD	LE_ELLIPSE_FACTOR	P2_Z_FACTOR	P3_X_FACTOR	P3_X_FACTOR	PLATE_LENGTH_STRAIGHT_FACTOR	TANGENT_END
study_02_des0001	166.71968	84.747842	2.3929295	0.57639585	0.60053699	0.864379	0.78510483	39.2740
study_02_des0002	164.17428	81.847476	1.781585	0.66795693	0.88103915	0.88830444	0.76486458	32.4063
study_02_des0003	177.28602	102.21289	2.5679839	0.67561219	0.63589941	0.7675869	0.78674871	34.9930
study_02_des0004	168.27275	95.922613	1.9744352	0.59110249	0.72049352	0.63790179	0.79612459	32.6708
study_02_des0005	165.57856	93.784687	3.1284951	0.61091138	0.67396962	0.67456532	0.75822702	36.2515
study_02_des0006	170.43525	109.61458	1.3254189	0.55505753	0.83819915	0.79620379	0.77236503	39.3426
study_02_des0007	161.23949	106.59741	3.361247	0.6431627	0.76983495	0.716367	0.76253097	38.3288
study_02_des0008	177.94924	104.79749	2.7447371	0.62902498	0.8105251	0.72475057	0.77726018	31.2854
study_02_des0009	179.53757	87.30714	1.1312822	0.54586193	0.69807445	0.68205488	0.75546221	35.8252
study_02_des0010	162.52021	100.583	2.1112795	0.50485373	0.6560074	0.81398472	0.7830442	30.2554
study_02_des0011	172.70944	91.49543	3.7861631	0.60658686	0.71643758	0.75000446	0.7508624	31.5325
study_02_des0012	171.42363	83.497813	3.8935198	0.53587931	0.85192732	0.65623979	0.79922938	37.8990
study_02_des0013	174.1273	[illegible]63579	3.5434907	0.69151609	0.75798932	0.8496989	0.79055914	33.4334
study_02_des0014	163.0885	[illegible]09947	1.5619625	0.65721097	0.79663799	0.61312239	0.77564485	34.2917
study_02_des0015	175.94175	98.016777	2.8100976	0.51767446	0.87949827	0.82191937	0.76852508	36.9171

171.42363 (r11,c0)

Here is a picture of the

DESIGN VIEWER,

to check and compare the geometries ...



	study_02_des0001	study_02_des0002	study_02_des0003	study_02_des0004	study_02_des0005	study_02_des0006	stu
	166.71968	164.17428	177.28602	168.27275	165.57856	170.43525	
	84.747842	81.847476	102.21289	95.922613	93.784687	109.61458	
	2.3929295	1.781585	2.5679839	1.9744352	3.1284951	1.3254189	

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