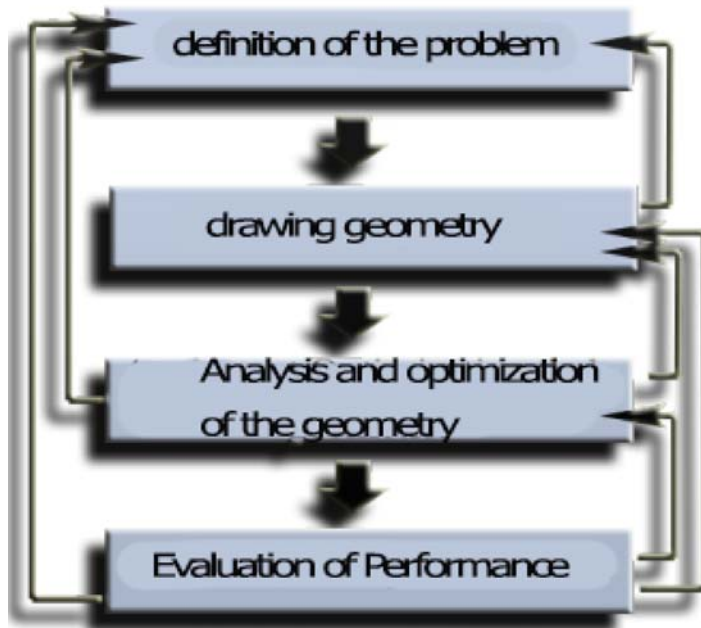


Phases of design, wing or propeller wind turbine

Heliciel proposes, organization design phases of the propeller, allowing a flexible ergonomic design..

The different phases of the design of a propeller can be defined as:

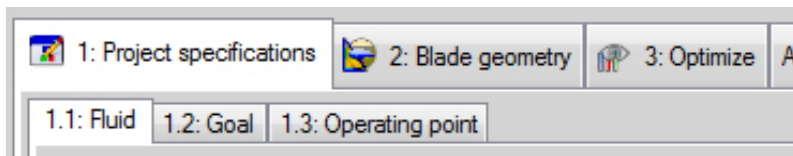


- **Problem definition (Project Data)** is mainly to collect the necessary data, to the definition of the operating point of the propeller.. The objective of our propeller will, depending on the project, capturing the energy of a fluid stream to turn power on the propeller shaft, or transform the power of the propeller shaft (engine power) in thrust on a fluid stream. The fluid in question may be a liquid such as water or a gas such as air.
- **The design of the geometry.** The geometry of the blade, of the wing, or of the propeller and the blades is effected using the known patterns, or design assumptions. For example, our design hypothesis can be: maximum blade length (lower losses blade tip), minimum thickness (performance profile of the blade) , Minimum volume of matter (weight reduction, cost and friction) , Simple Shapes (manufacturing facility) ...
- **The analysis and optimization of the geometry** Are related to the design of the geometry in an interactive loop , for refining and optimize the geometry in accordance with the definition of the problem. The design method should be flexible enough to allow a redefinition of the problem in case of infeasibility and incompatibility of certain parameters
- **The performance evaluation** is done by testing prototypes or models. But before you actually build the propeller, we will test it virtually by the method of blade elements. Then, new definitions of the problem, analysis, and geometry optimizations can be considered. So we design a geometry, check resistance and test its performance up to satisfaction.

In the **software, for propeller and wing calculation heliciel**, tabs, and a progression tree, highlight this design organization, but also allow to navigate freely between the different phases of implementation of the propeller or wing.

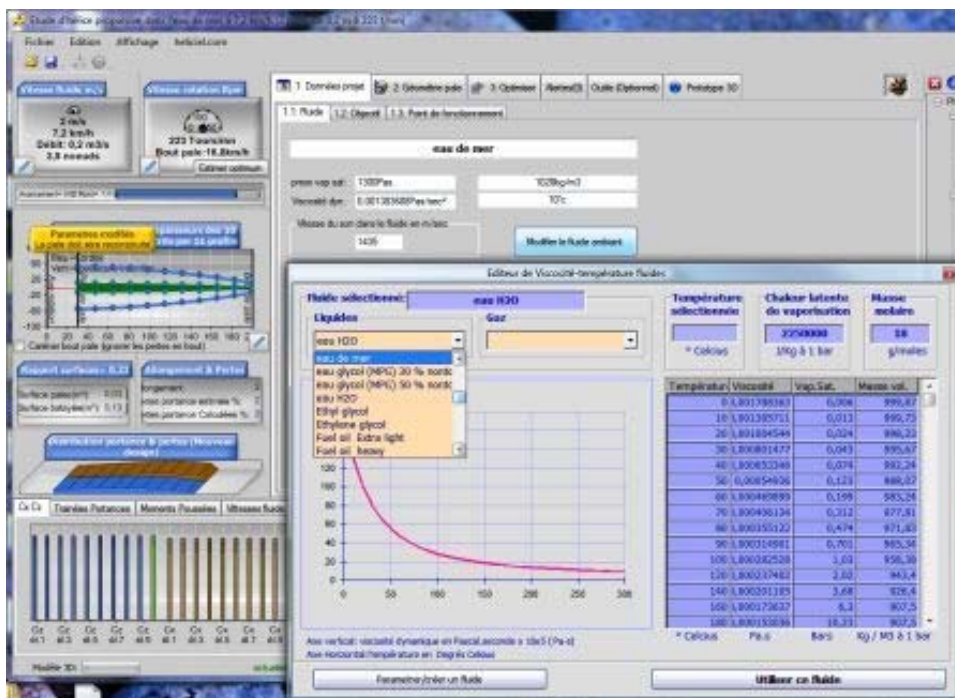
Phases of design, wing or propeller wind turbine

1:Project specification:



1.1:Editor fluid: First we select the ambient fluid and temperature using the editor fluid.

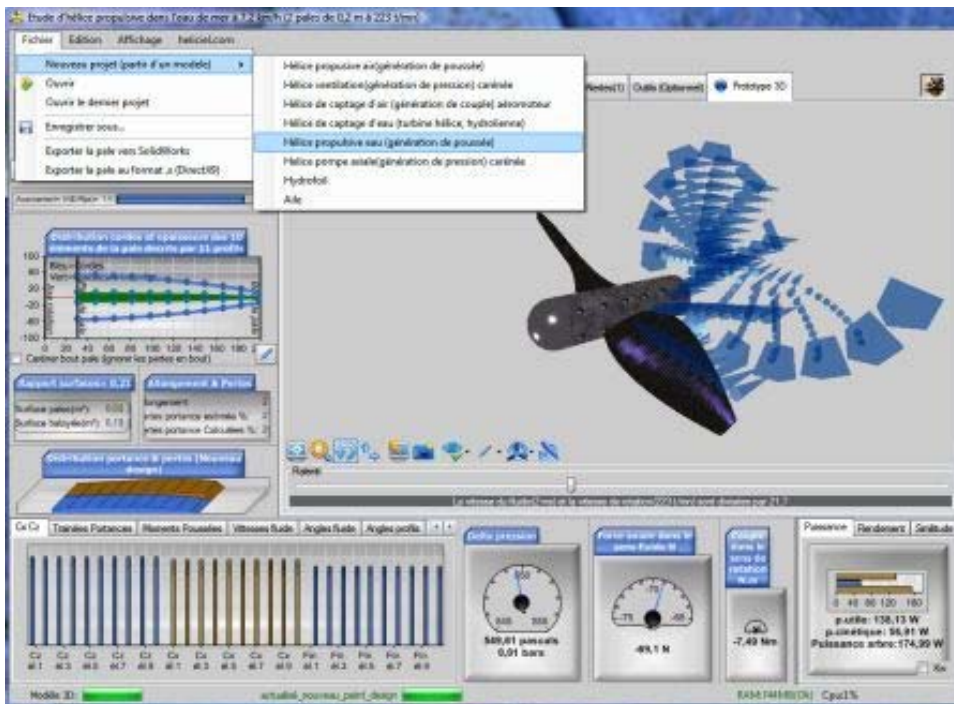
About 120 gases or liquids and their data density and viscosity according to the temperature used directly. For air the altitude will be required to adjust the density according to the pressure.



1.2:Choosing the type of study and objective: We continue by selecting the objective of our propeller or wing

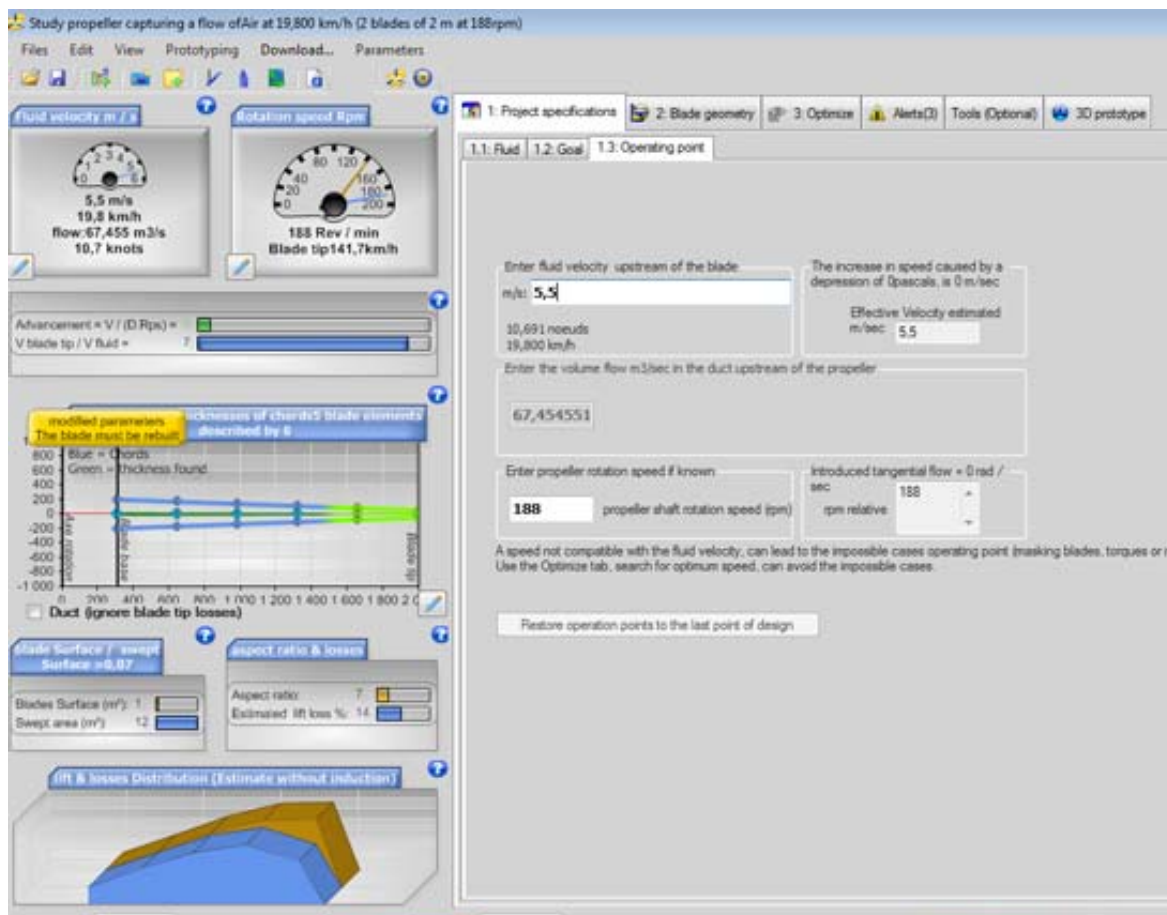
4 types of studies and goals are achievable with Heliciel:

1. Propulsion propellers (boat propellers, propeller aircraft, helicopters propellers...)
2. Propellers pressure based on flow (propeller ventilation propellers axial pump...)
3. Propellers energy harvesting (aeroengine, wind turbines, tidal turbine, turbine axial Kaplan ...)
4. Wings and foils (wings, fins, foils, hydrofoils, sails, fins, rudders, rudder, airships, hull...)

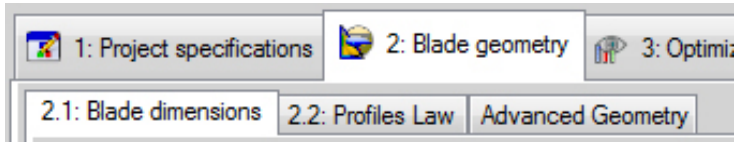


1.3: Operating point:

Fluid velocity (or from the vehicle) and the desired rotational speed (if known, otherwise the optimum speed will be proposed).

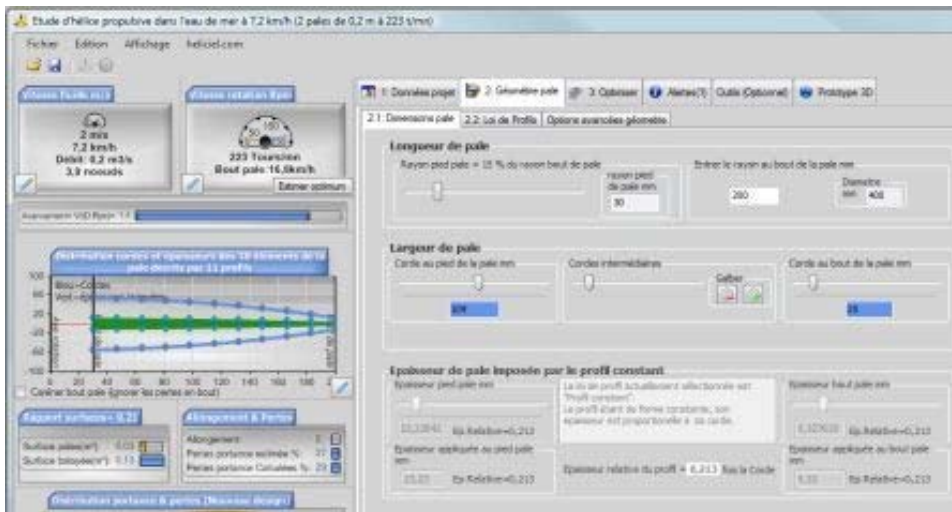


2 The geometry of the blade or wing:



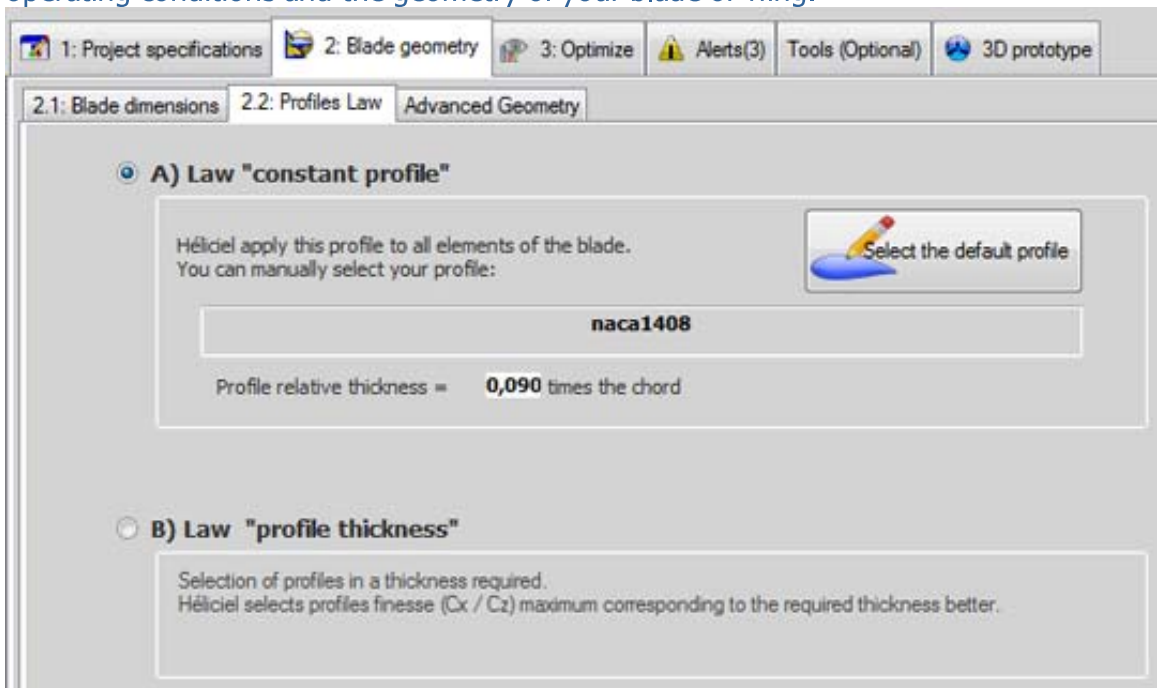
2.1: Dimensions of the blade::

In the blade dimensions tab, a series of sliders allows you to model the shape of the blade or wing in all its dimensions. (see [chords distribution](#) and [thickness distribution](#))



2.2: Law of automatic selection of profiles in the database

Héliciel uses its database performance profiles to choose the optimum profiles, corresponding to the operating conditions and the geometry of your blade or wing.



Two laws selections blade profiles or wing are at your disposal:

- **A: Law constant profiles:** Heliciel applies the form of profile you have selected all along the blade. The thickness of the blade is connected with the chord (width) of the blade.. This law of selection is

the simplest and is highly recommended for beginners.

- **B: Law of the thickness profile:** Cette loi de profil vous permet de choisir l' évolution de l'épaisseur le long de la pale, les profils seront donc de formes différentes. Héliciel recherche et sélectionne les profils de performances optimum correspondant au mieux à l'épaisseur désirée .Cette loi de profil demande un peu plus d' expérience car elle implique souvent des discontinuités de formes et d'incidences qu'il faudra gérer grâce à des fonctions de lissage d'incidences et de forçages de forme de profils..

2.3: Advanced geometric Option:

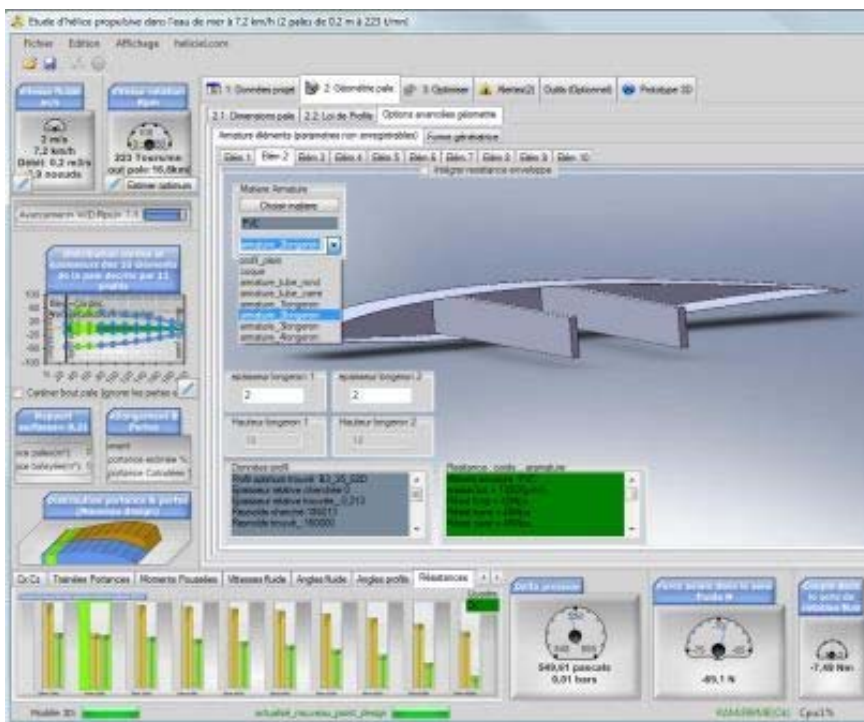
(Advanced features are optional and the beginner can ignore)

It is possible to determine the material and the building structure of the blade or wing. These parameters are used to calculate the resistance of the blade elements, and allow you to choose your material construction.

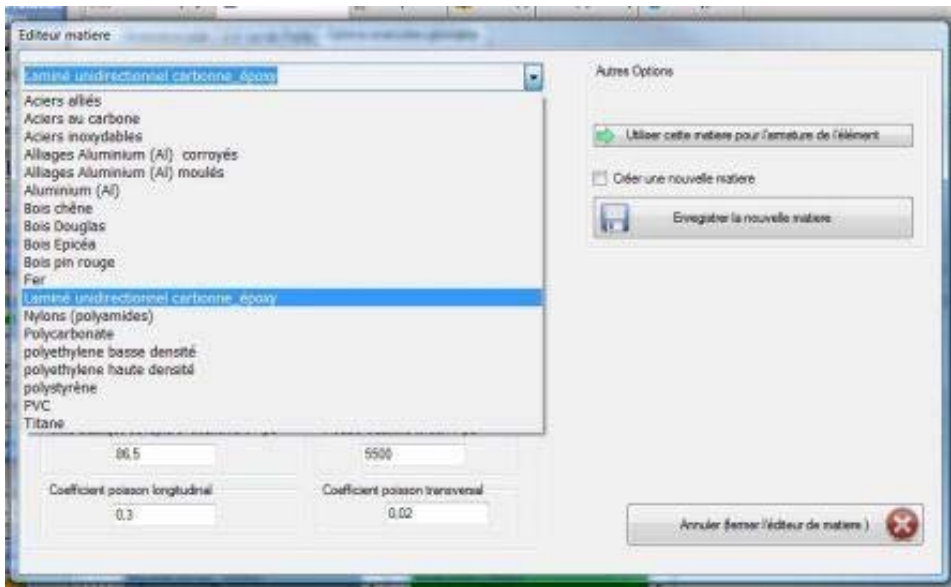
Structure and material of the blade (advanced geometry function):

The blade or wing may be of various structures :

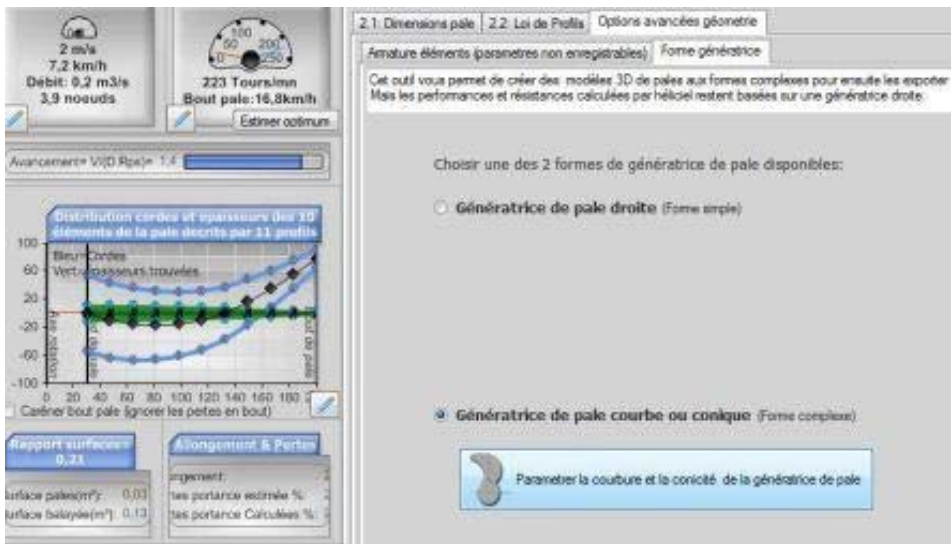
- rib 1,2,3, or 4 beams
- full
- hull
- round tube frame
- square tube frame



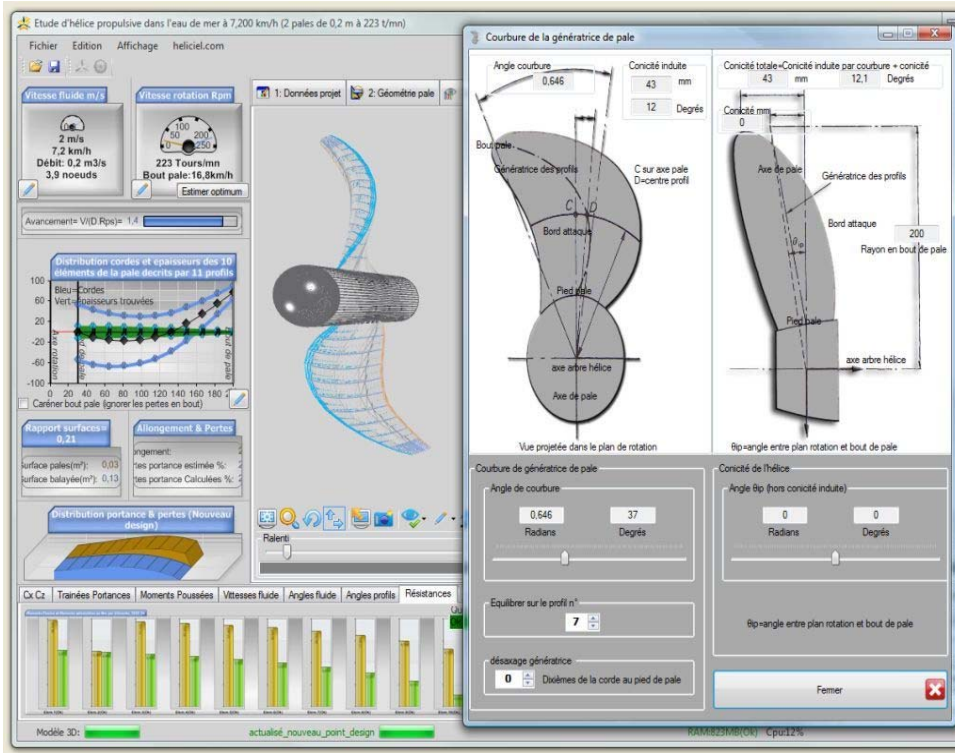
A material editor allows automatic parametrage resistance data. You can record and add other materials that you know the mechanical characteristics.



Form generatrix (Advanced blade geometry function):



The other function of advanced blade geometry, changes the alignment generatrix profiles propeller blade. This option allows you to generate 3D models of complex shapes.



The blades generating curvature is not considered in the calculation of performance and resistance. The blades straight or curved generatrices have the same resistance and performance, as in the blade of curvature actually affects these parameters.

3:Optimize.

The tab "Optimize" includes optimum speed search functions. The number of blade can be changed and tested. The influence of the number of blades on the rotational speed with the best performance, is thus demonstrated.



For a more detailed description of the functions of HELICIEL: [Heliciel details!](#)

tutorials: [tutorials HELICIEL](#)