

# Tutorial design a boat screw propeller (3): Construction adjusting the rotation speed and radius at blade root

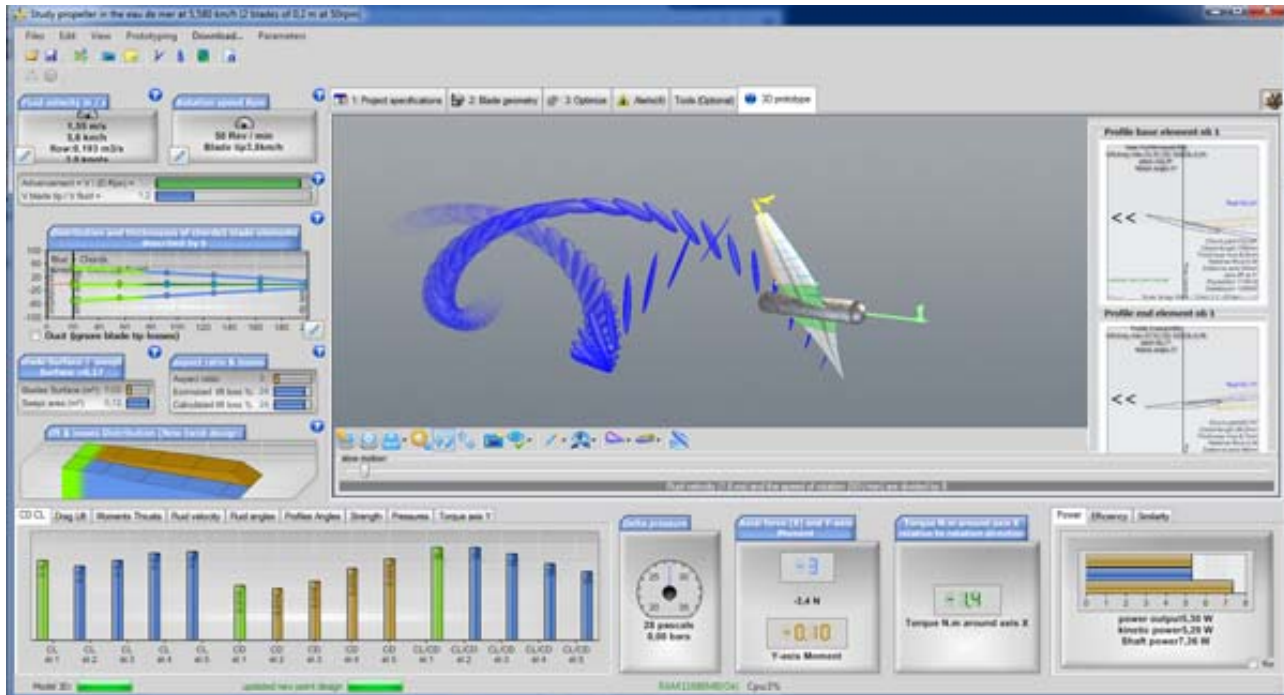
[Tutorial design a boat propeller \(1\)](#)

[Tutorial design a boat propeller \(2\)](#)

[Tutorial design a boat propeller \(3\)](#)

[Tutorial design a boat propeller \(4\)](#)

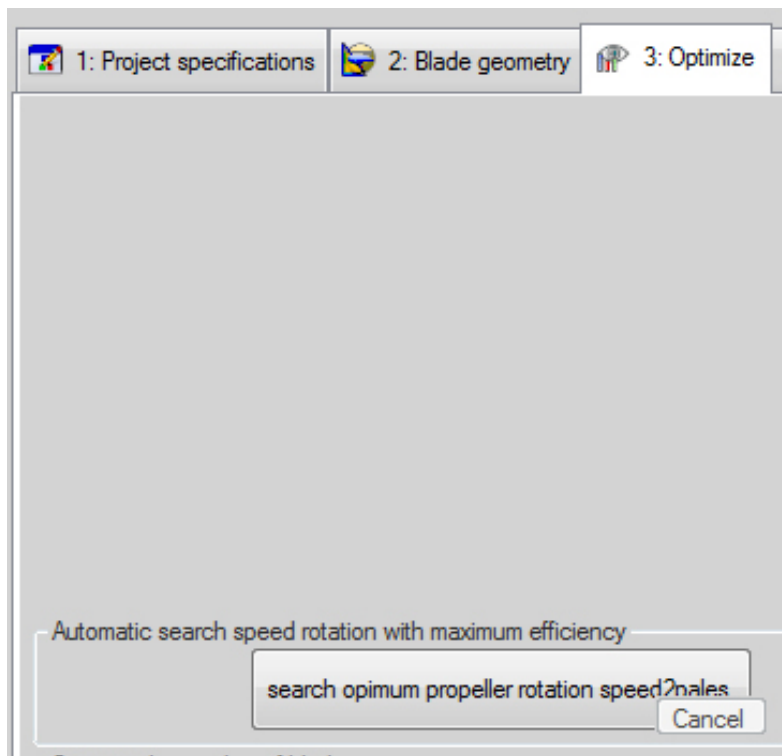
[Tutorial design a boat propeller \(5\)](#)



We left the rotational speed, when we define the operating point, it is time to care of:

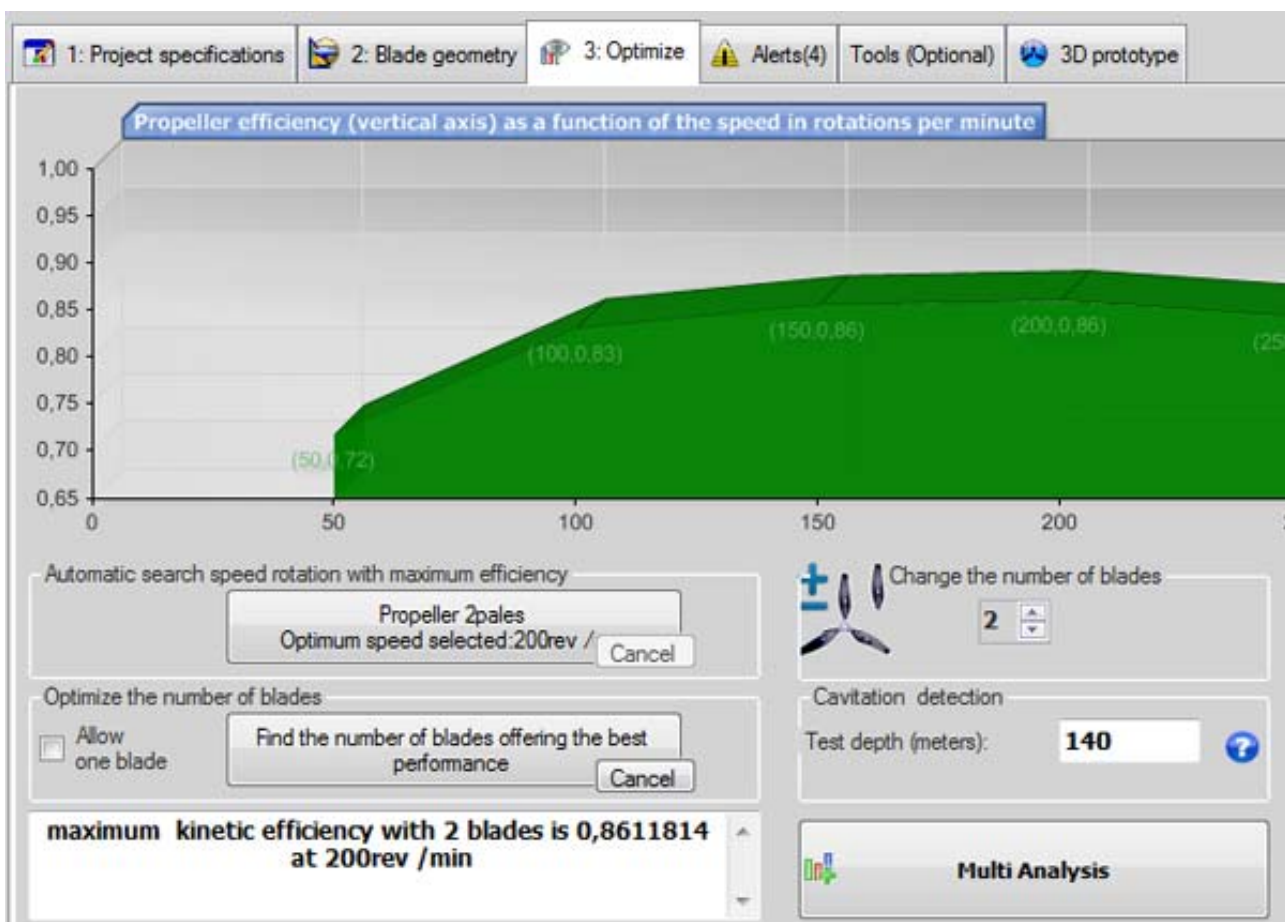
We could test the propeller rotational speeds, changing this setting and rebuilding, until you find a speed with a good efficiency. But these iterations may be long and tedious. We therefore take this opportunity to discover a new function Heliciel: **Optimizing the rotational speed depending on the optimum efficiency.**

- To do this select the **tab:3 Optimize.:**



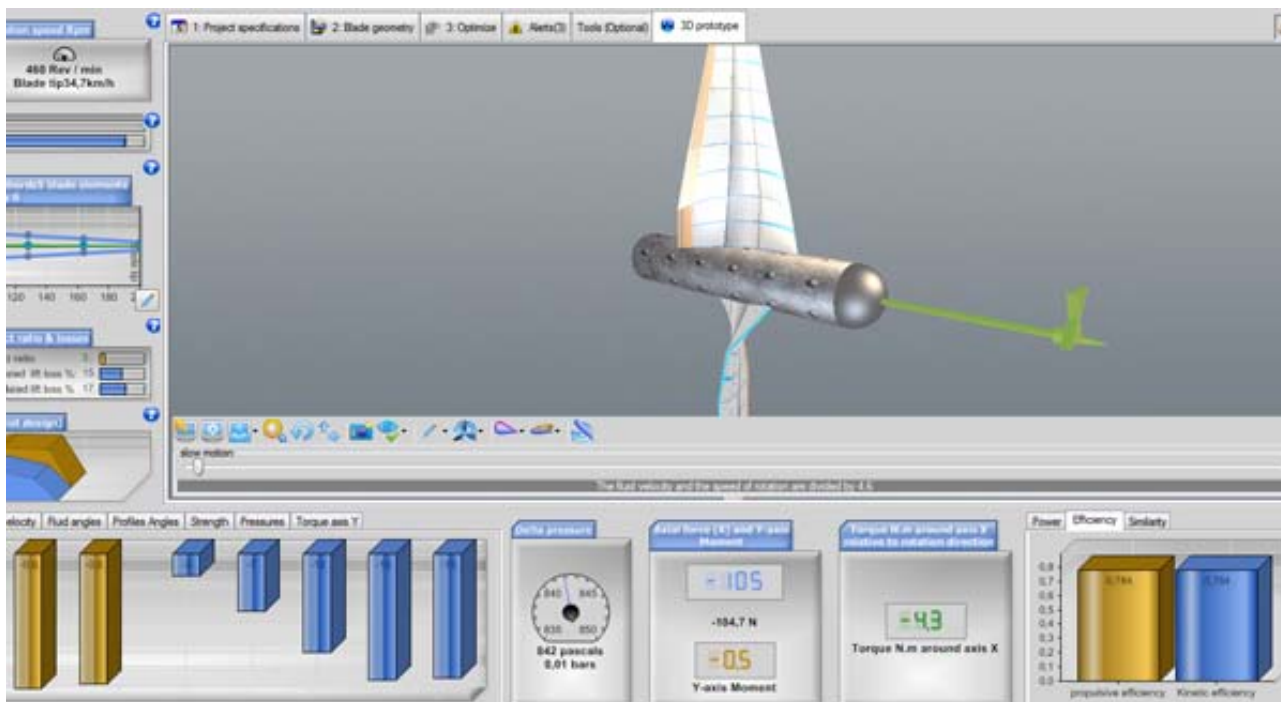
Click "**search optimum propeller rotation speed 2 blades**". Heliciel execute the search rotational speed with the maximum kinetic efficiency. (the propulsive efficiency is not a reference in this procedure for propellers with fluid velocities close to 0 the propulsive efficiency would not be significant)

Here we get a kinetic efficiency of 0.86 at 200 rev / min:



After the search of optimum speed you are asked if you want to rebuild your 3D propeller, click yes .We get our propeller rebuilt with a new twist, suitable for its speed, providing the optimum efficiency:





- **Increase the surface area of the blades:** Two methods allow us to increase the surface area of blades:
  - Increase the number of blade:
    - Advantage: When the diameter should not be increased (it is often the case for vessels must maintain navigability in shallow water) ,it is possible to increase the number of blades to increase the thrust.
    - Disadvantage: The weight, complexity and price of the propeller will be increased.
  - Increasing the width of the blades:
    - Advantage: By increasing the width of the cords of blade profiles we increase the surface lift and reduces the risk of cavitation..
    - Disadvantage: The blade tip losses are even lower than the blades are elongated by increasing the width of the blades without increasing the length we increase the proportion of losses at the blade tip.
- **Increase the number of propellers:**
  - we could add a contra rotating propeller helice contra rotative:
    - Avantage: propeller downstream can straighten the tangential flow, the overall performance of two coupled helices will be better.
    - Disadvantage:more complex and more expensive to achieve.
- **Increase the performance of blade profiles:**

A search of the optimum profile shapes, requires a comparative performance of different profiles available to our analysis.This solution takes us directly into the heart of HELICIEL, which has been developed to easily find the best profiles in its database .....

next: Tutorial boat propeller design (4)