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Finding clearance between the propeller tip and the nozzle

Having a sufficient gap between the propeller tip and the nozzle is of practical importance to avoid interference.

Nozzle inner diameter larger than propeller diameter.

When looking at tip clearance; only inner surface of nozzle and the tip section of the propeller is important.

From clearance point of view the geometry can be simplified into two cylinders ς see next slides.

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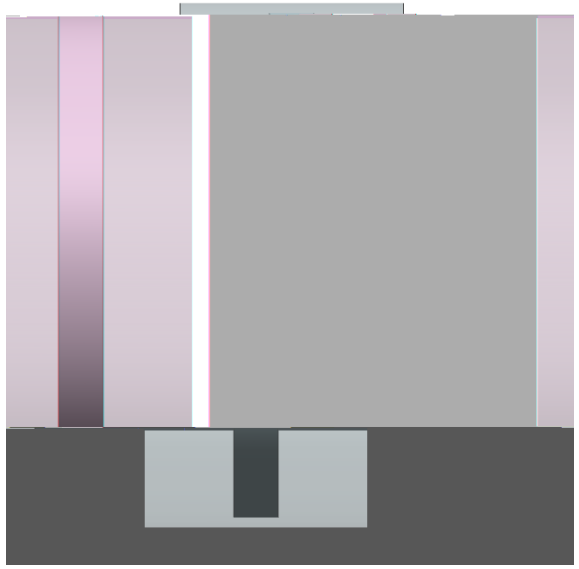
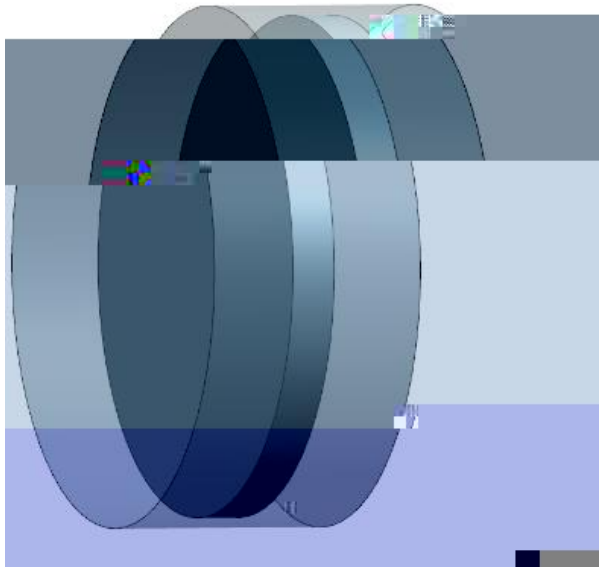
Propeller concentric with nozzle

Clearance:

0.5 x (Dia nozzle ς Dia prop)

Easy ς no problem!



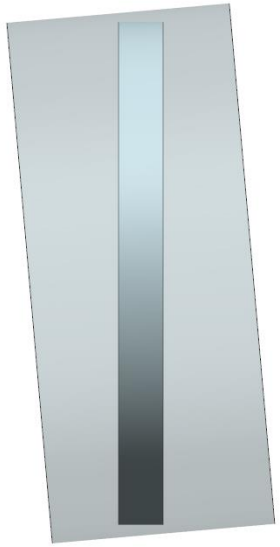


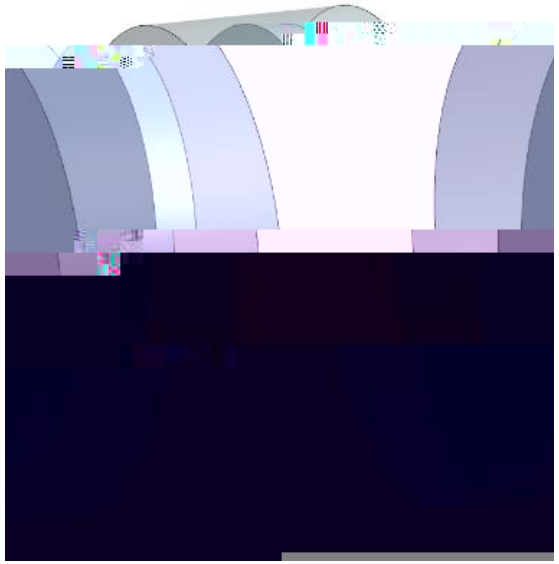
Nozzle tilted with regards to propeller

Clearance:

- How to calculate analytically?

It is tempting to see this as a 2D problem only looking at the top or bottom in the left picture, but it is not, the case needs to be considered in 3D.





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Why are nozzles sometimes tilted?

To avoid or minimize the Coanda effect when propellers with nozzles are close to the ship hull

The water follows the glass as a result of the Coanda effect