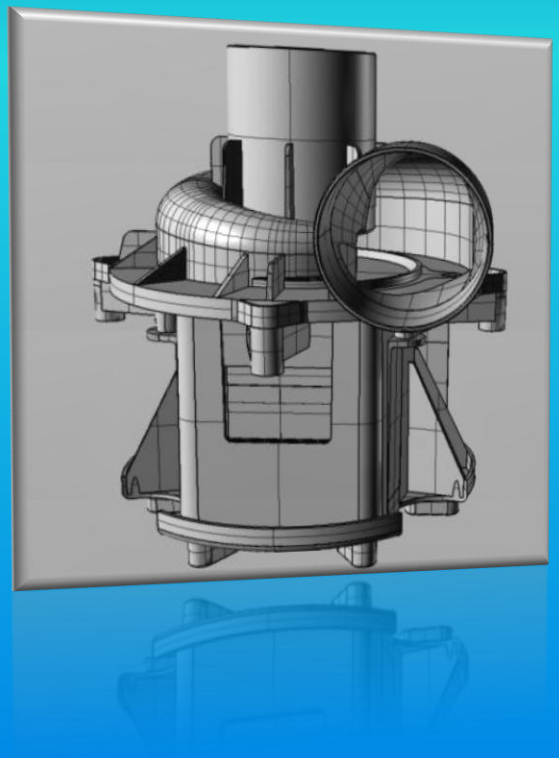
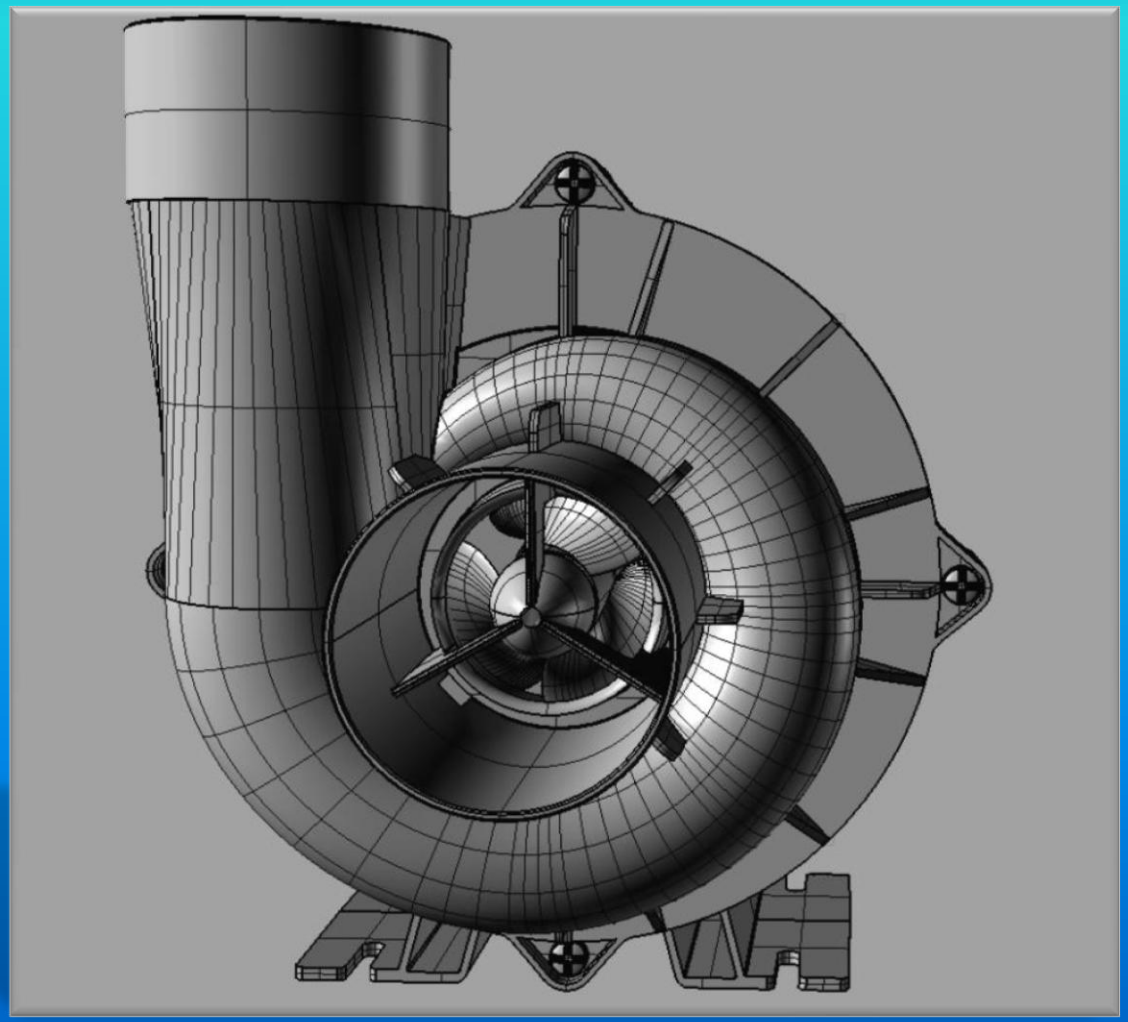
The AXiaL pump



New concepts for a pump



PROJECT

excellence in aquatics

The new AXiaL pump is the subject of a post graduation course with the title

“METHODS AND TECHNOLOGIES FOR PRODUCT AND PROCESS INNOVATION”

proposed by the Veneto region in cooperation with the university of Padova and Project srl.

Unione europea

Ministero del Lavoro, della Salute e delle Politiche Sociali

Direzione Generale per le Politiche per l'Orientamento e la Formazione

Regione del Veneto

Project leaders:

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Faculty of mechanical and aerospace engineering:

- Eng. Bruno Atzori
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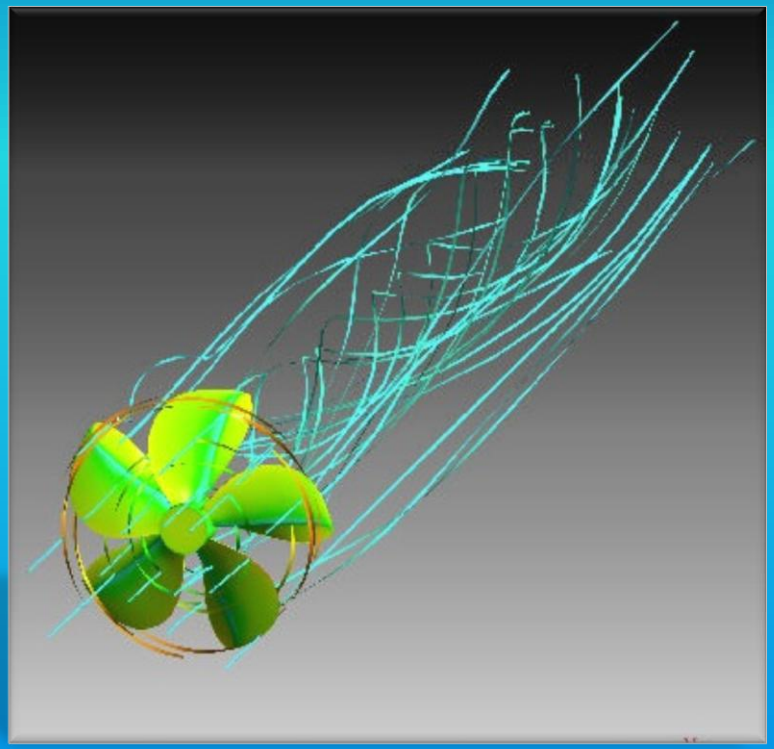
- Eng. Roberto Biollo

PROJECT AIM



The goal: a new pump with fluid dynamics concepts never used before for garden ponds.

Synchronous motor pump with axial flow to be used in a wet or dry installation.

Low consumption but high flow, with a particular attention on head.

The outcome: 2 MODELS

15.000 l/h

Fig. AXiaL impeller blade design for model 15.000

Q_{MAX} = 15.000 l/h
h_{MAX} = 188 cm
Power = 70 W

Inlet-outlet 2,5”

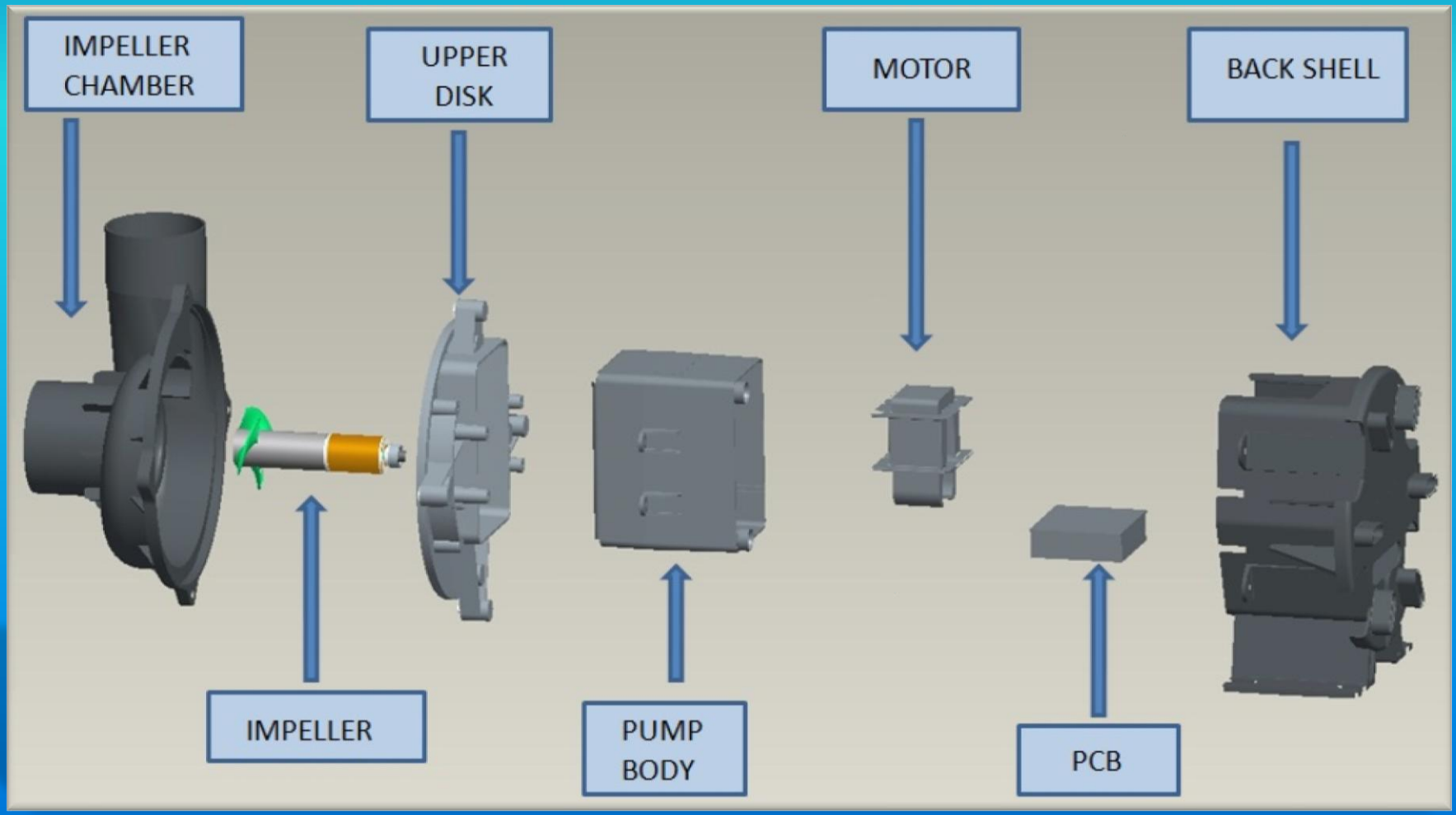
20.000 l/h

Fig. AXiaL impeller blade design for model 20.000

Q_{MAX} = 20.000 l/h
h_{MAX} = 188 cm
Power = 80W

Inlet-outlet 2,5”

EXPLOSION DRAWING



The IMPELLER: the heart of the project

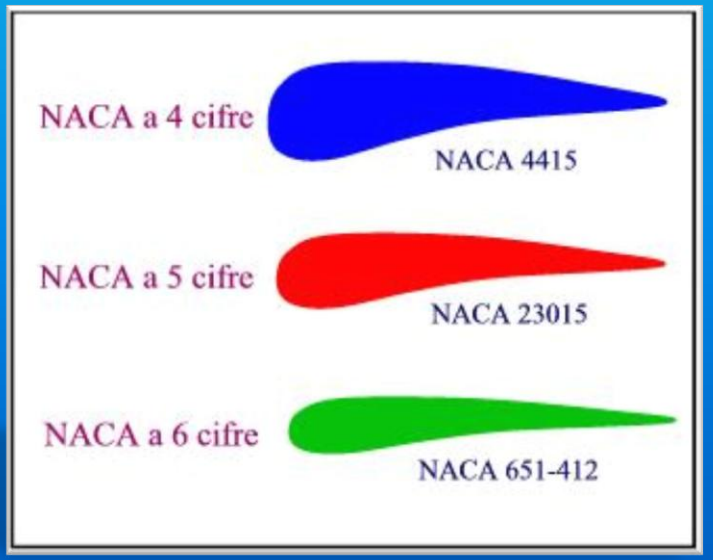
The IMPELLER SPECIAL GEOMETRY is the reason for a high flow with low consumption.

The airfoils are made from a symmetrical distribution of thicknesses overlying on an average line. The space agency NACA gathered and catalogued families of profiles which have become a global standard.

The use of NACA Literature concerning wing profiles gave to the impeller a shape typical of the Aero-naval sector industry.

3 NACA PROFILES

In the picture there are 3 different NACA profiles: they are grouped according to the number of digits. The 4-digit profile family is the most common.

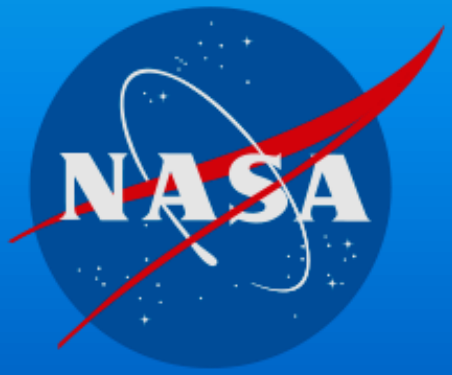


The history of NACA

The **National Advisory Commitee for Aeronautics** (NACA) was the Aeronautic National Division of Unites States.

Founded March 3, 1915 to undertake, promote and istitutionalize aeronautical research. It continued its work until 1 October 1958, when loosing supremacy in favour of the Soviets, it was necessary a revolution in the American space program.

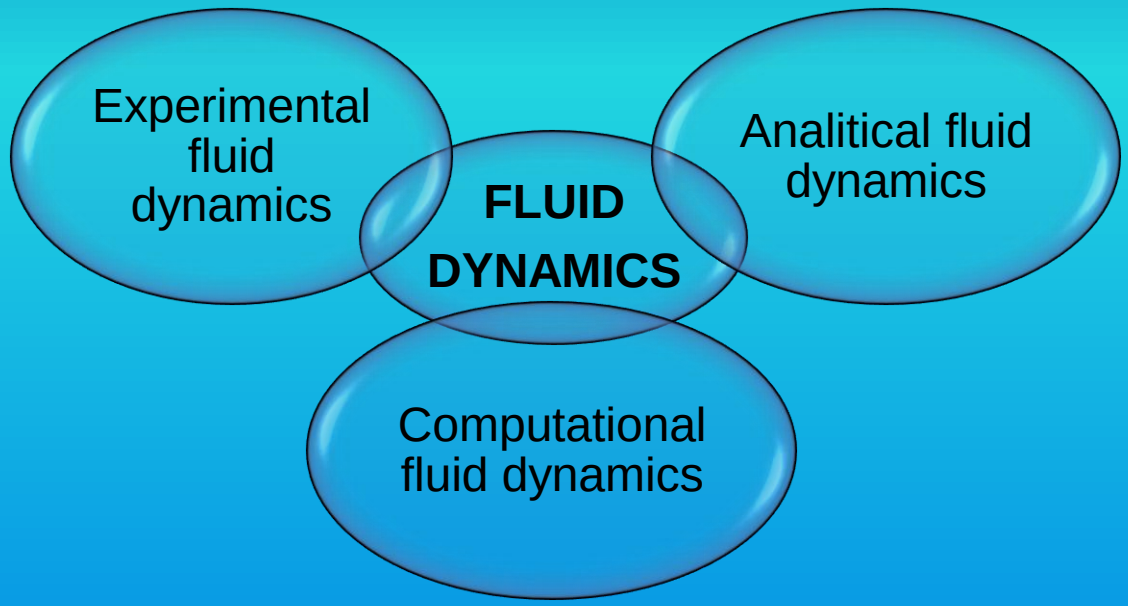
From its ashes, the National Aeronautics and Space Administration(NASA) arose.



The NASA currently is the government agency responsible for the civilian space program of the United States of America and the military aerospace research.

FLUID DYNAMICS ANALISYS: Ansys 13.0

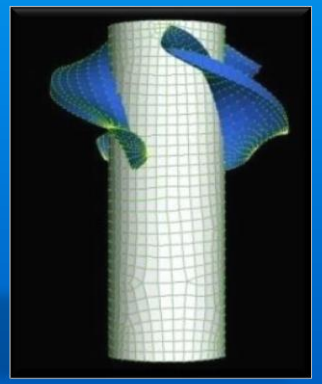
There are 3 different methods to study fluid dynamics:



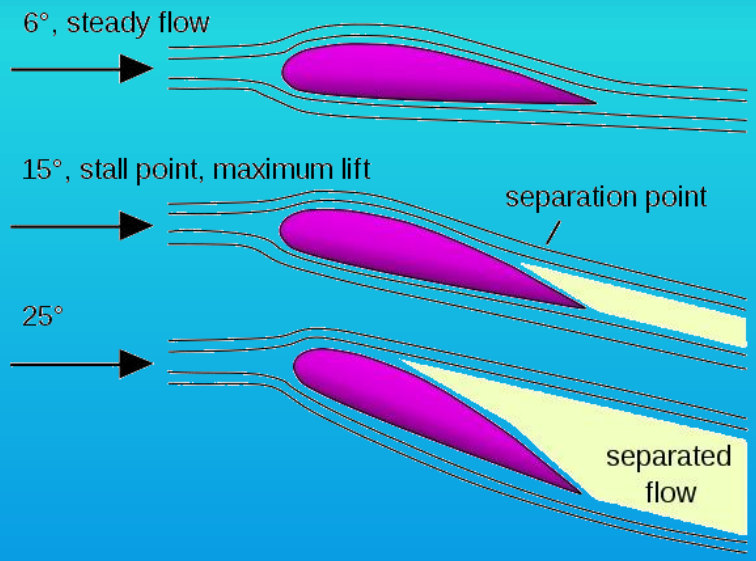
COMPUTATIONAL FLUID DYNAMICS is the tecnique that allows the study of fluid dynamics problems using the PC.

The typical approach requires to discretize the fluid domain into elementary cells (MESH) on which to apply iterative resolution methods.

ANSYS 13.0 is one of the best software to make this type of analisys.



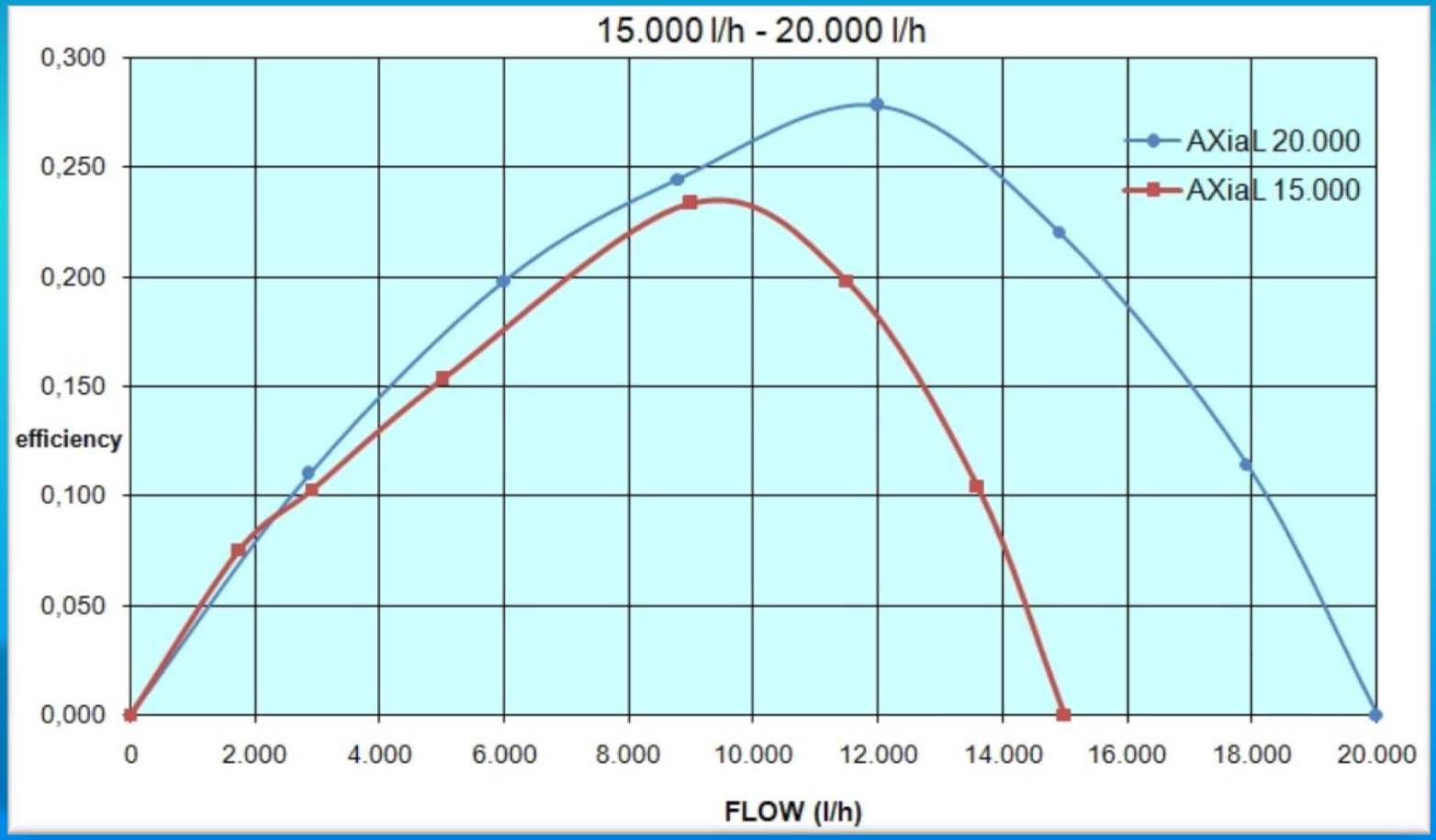
AERODYNAMIC STALL:



In fluid dynamics, a stall is a reduction in the lift coefficient generated by an airfoil as angle of attack increases.

A fluid flowing past the surface of a body exerts a surface force on it. Lift is defined to be the component of this force that is perpendicular to the oncoming flow direction.

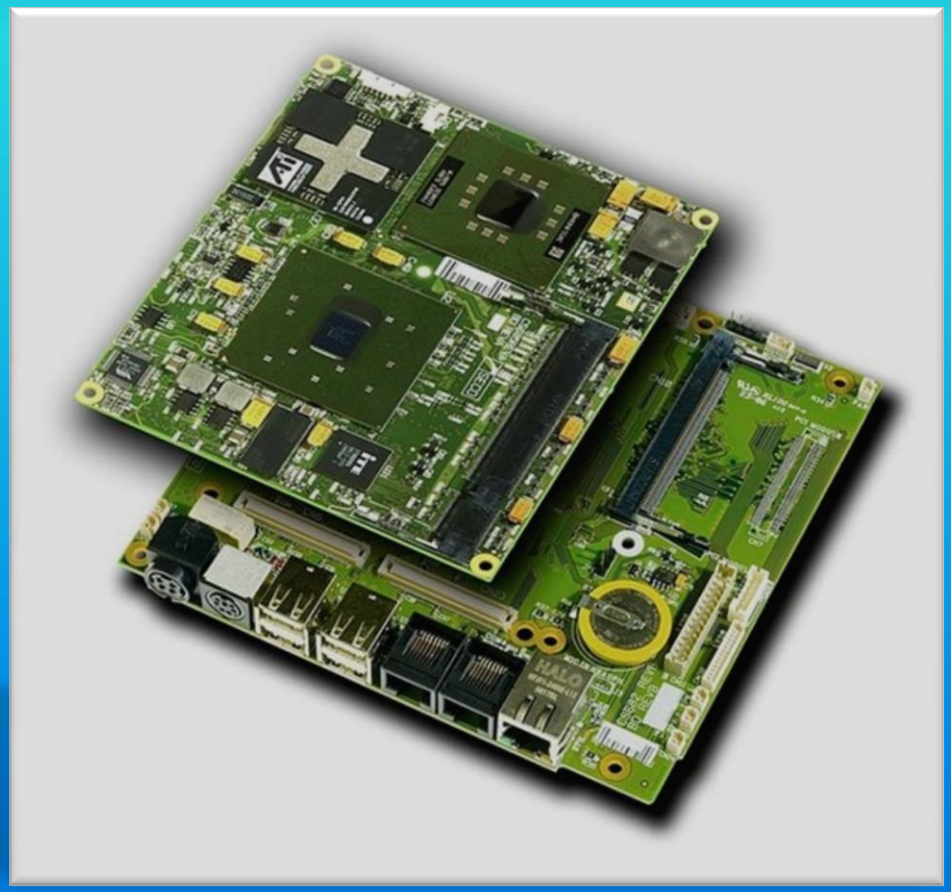
The efficiency to avoid stall problems



All axial impellers manufactured by the entire industry have the tendency to stall

Project avoided the problem by brillanty balancing efficiency and performances

Integrated Printed Circuit Board pump control



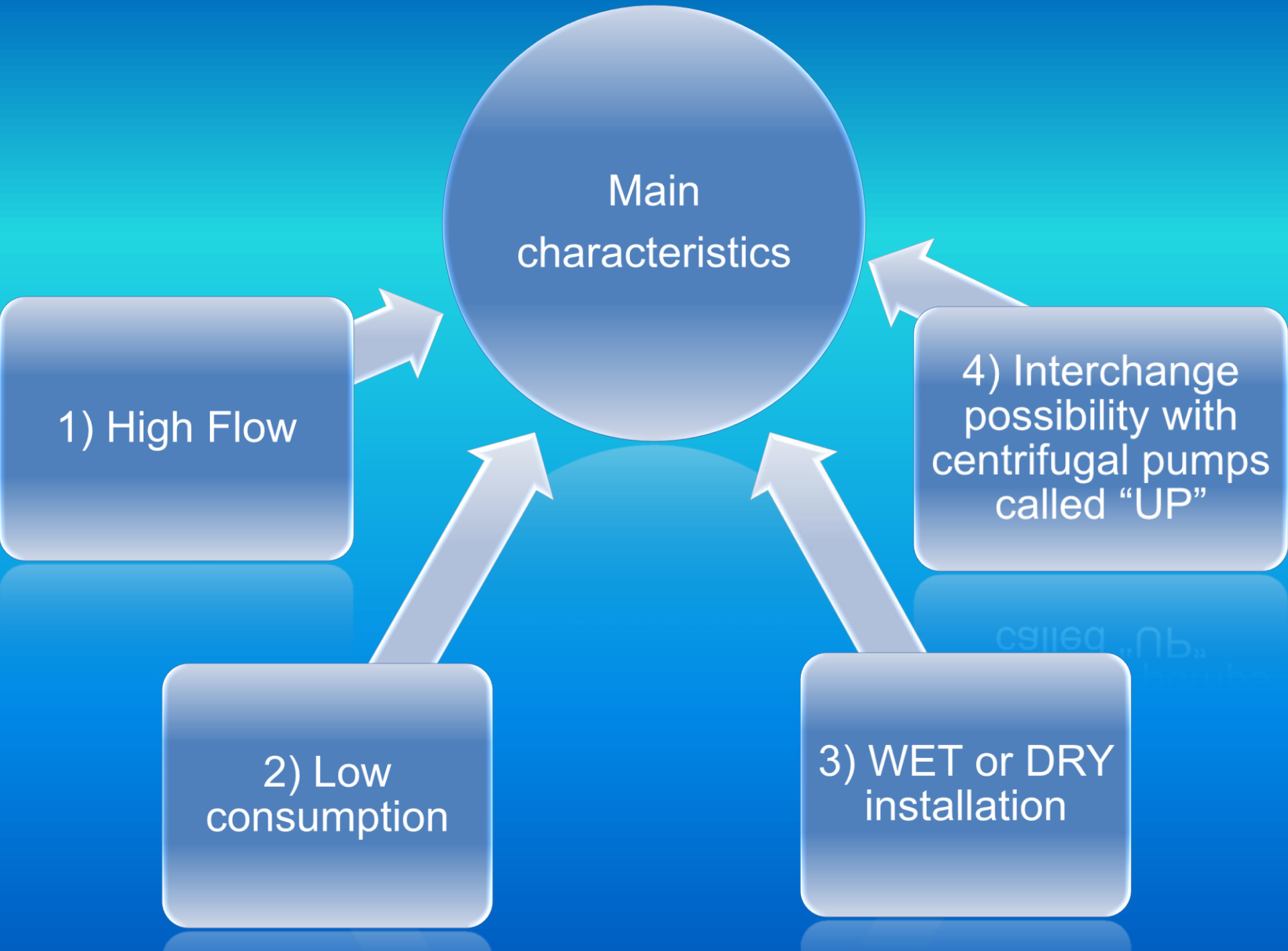
-To check sense of rotation;

-To shut off pump and avoid overheating and damages if working without water (sensing the lower power consumption).

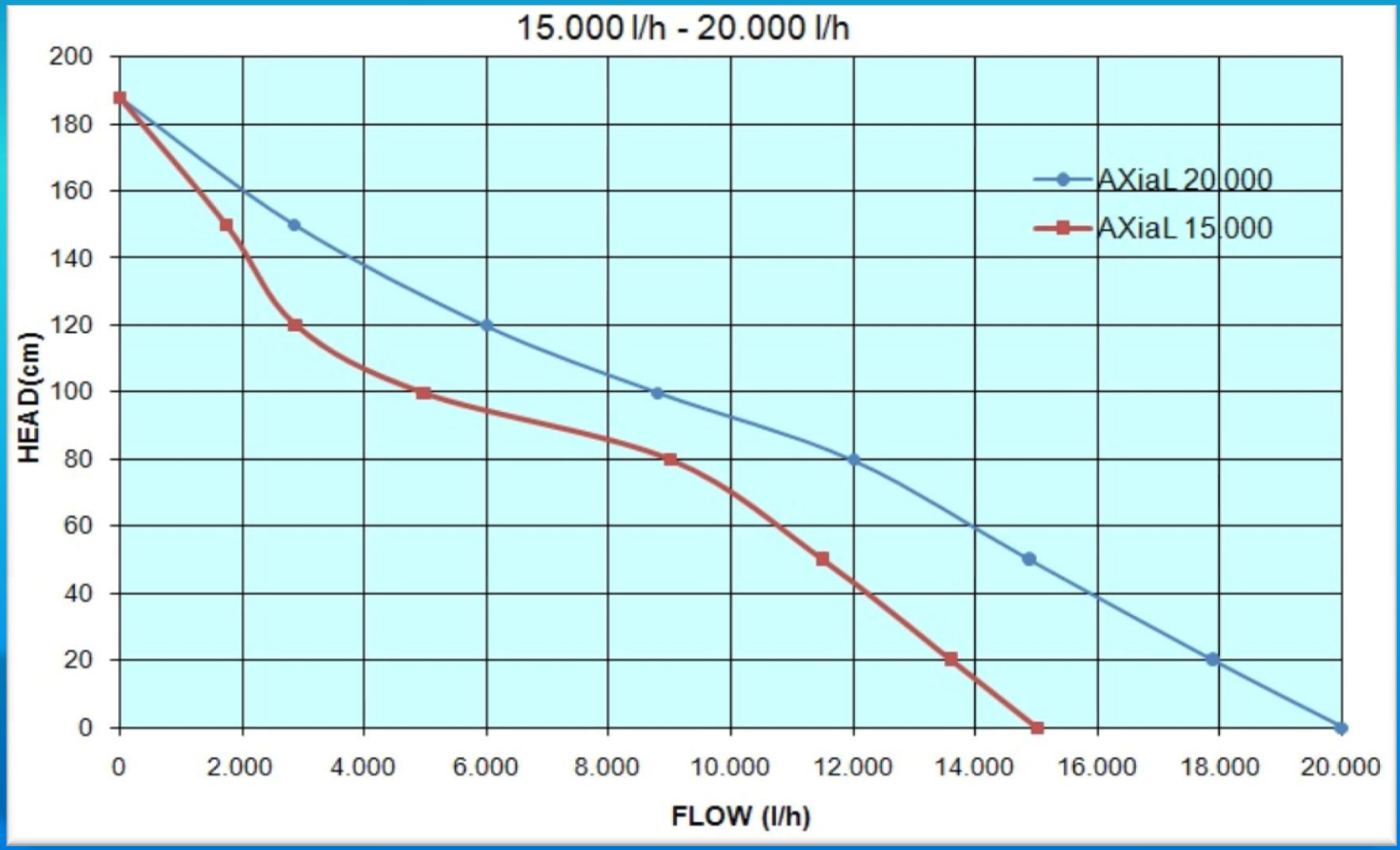
Synchronous motor

AXiaL pumps use permanent magnet synchronous motor

This motor is particularly suitable for this type of pumps: its performances are higher than asynchronous motors because they minimize the losses to the rotor


Main characteristics
1) High Flow
2) Low consumption
3) WET or DRY installation
4) Interchange possibility with centrifugal pumps called “UP”

1) HIGH FLOW



The main quality of these pumps is the **great flow** of water with such a low power consumption.

Great flow video

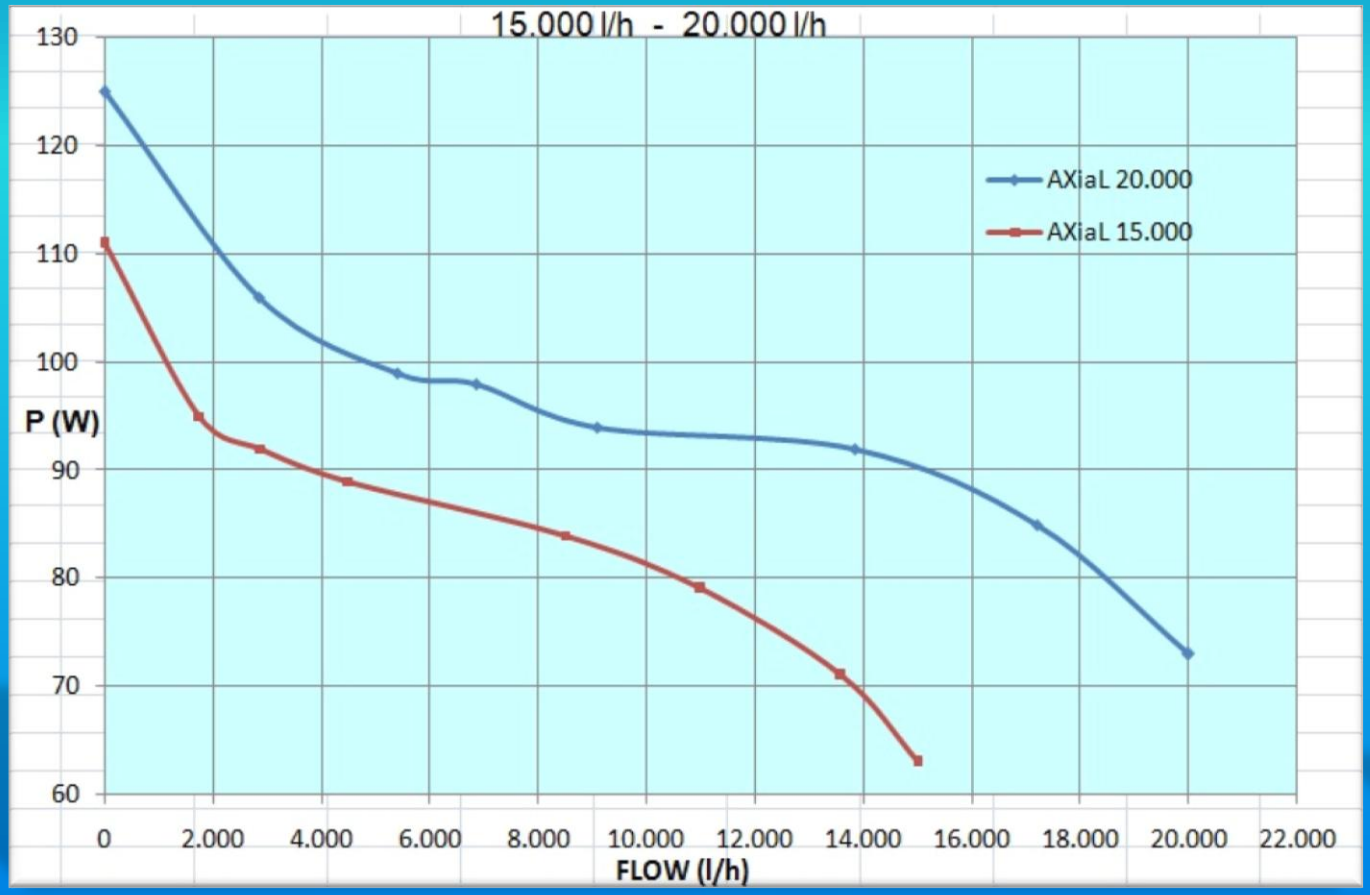
http://www.project-pumps.it/website-pj-04/deposito/The_AXiaL_pump_video.wmv

[21 MB]

TO PLAY
Double-Click ON

This video shows the considerable flow.

2) Low consumption

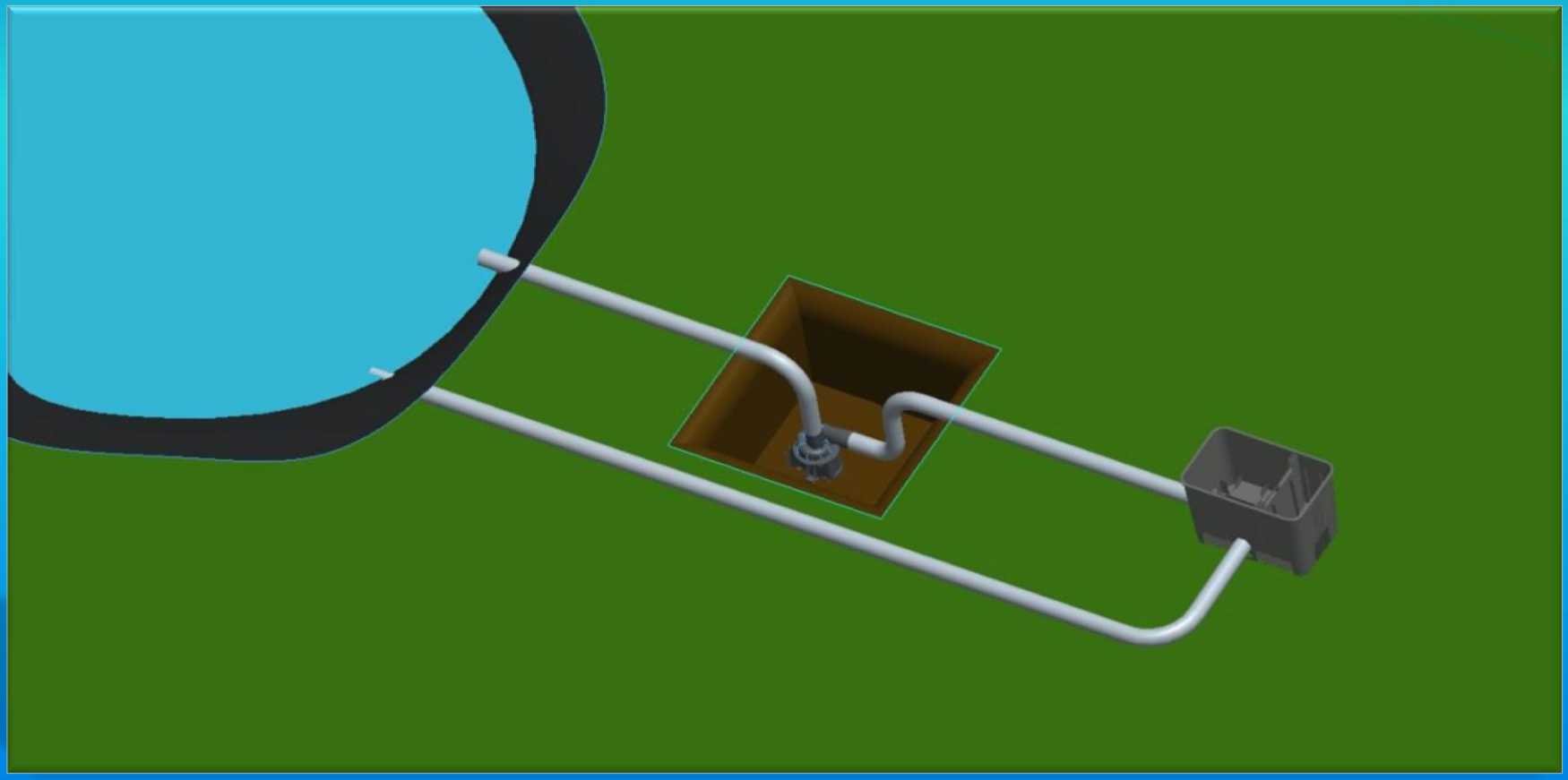


- Low power consumption is a major feature, in accordance with the "*green line*" taken by our company in recent years.

- 70 W with a flow of 14.000 l/h for the 15.000 version
- 80 W with a flow of 18.000 l/h for the 20.000 version

these are values well below the other pumps on the market actually.

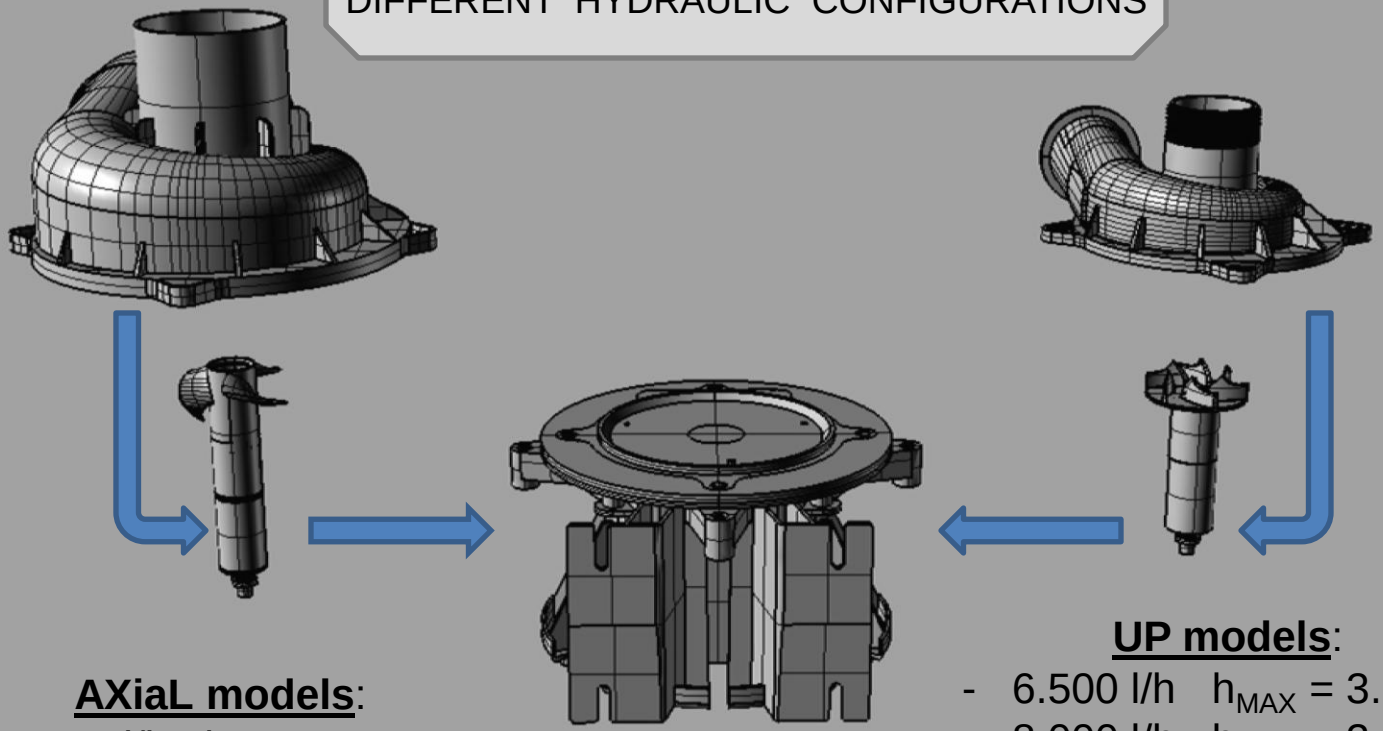
3) WET or DRY installation



The pump can be used completely submerged in water (**WET**), but once primed, it can also safely be used completely outside the water basin (**DRY**).

4) Interchangeability with UP pumps

THE SAME BODY
AND
DIFFERENT HYDRAULIC CONFIGURATIONS

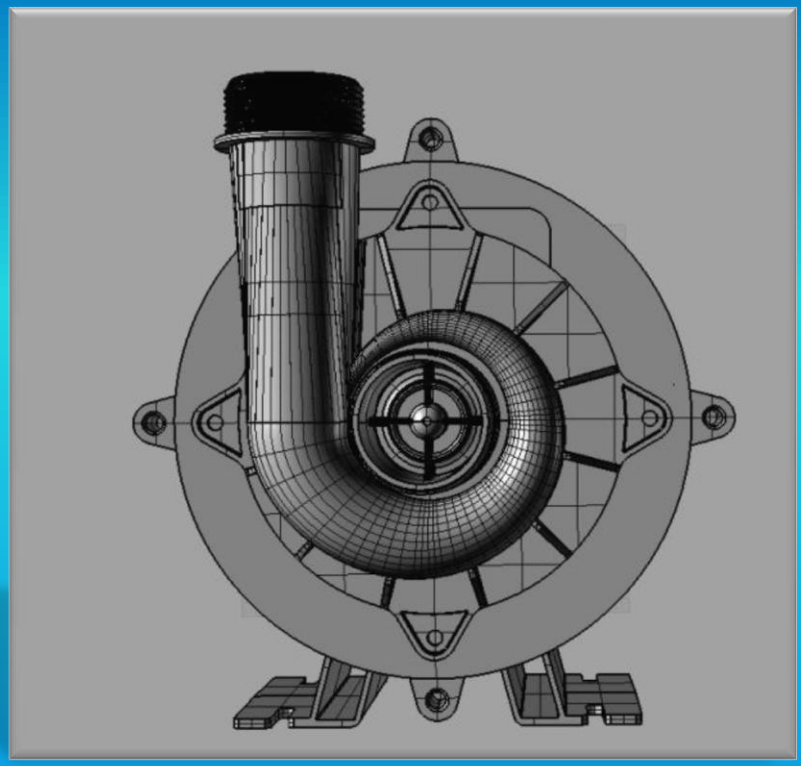


AXiaL models:
- 15.000 l/h h_{MAX} = 1.88m
- 20.000 l/h h_{MAX} = 1.88m

UP models:
- 6.500 l/h h_{MAX} = 3.50m
- 8.000 l/h h_{MAX} = 3.50m
- 10.000 l/h h_{MAX} = 2.80m
- 12.000 l/h h_{MAX} = 2.80m

6 different models ⇒ one body with different impellers and prechambers

The Up Pump



Unique modular, economical, centrifugal pumps.
One motor for four models.

Inlet-outlet 1,5”

4 models

UP 6.500

Q_{MAX} = 6.500 l/h
h_{MAX} = 3.50 m
Power = 105 W

UP 8.000

Q_{MAX} = 8.000 l/h
h_{MAX} = 3.50 m
Power = 105 W

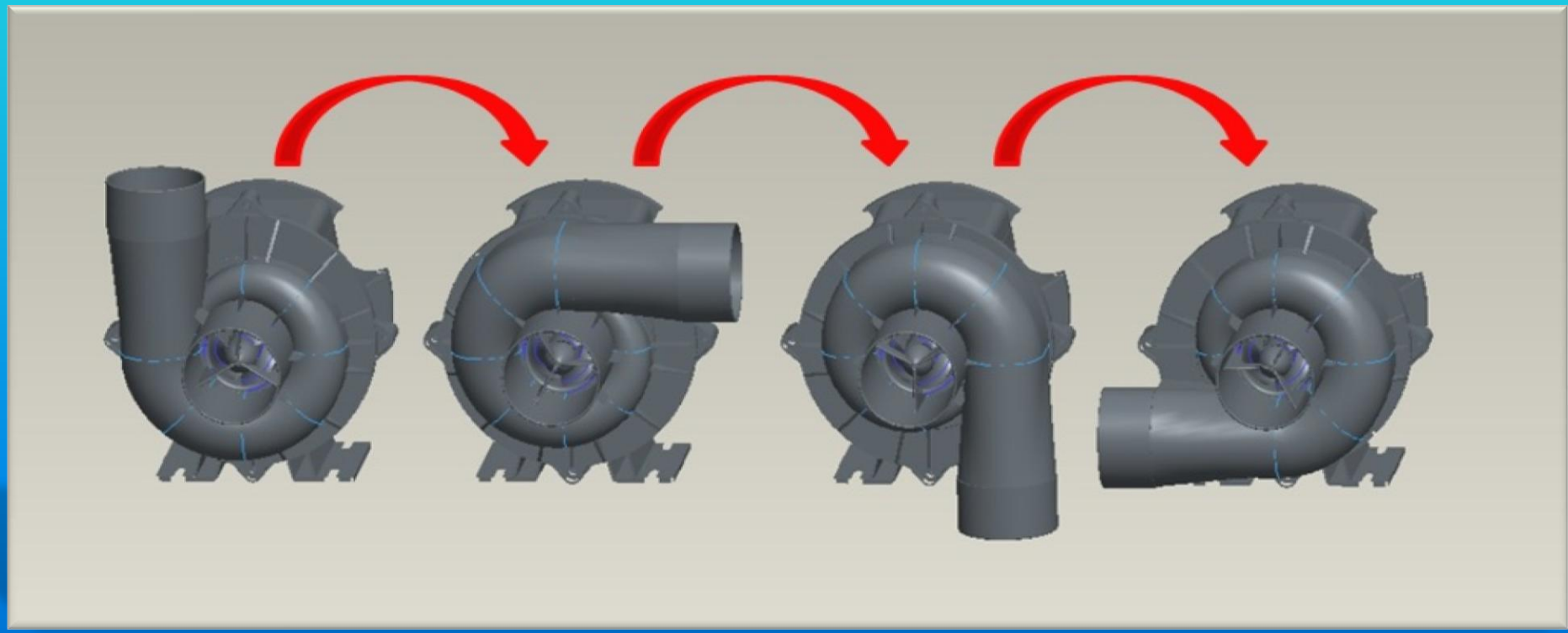
UP 10.000

Q_{MAX} = 10.000 l/h
h_{MAX} = 2.80 m
Power = 105 W

UP 12.000

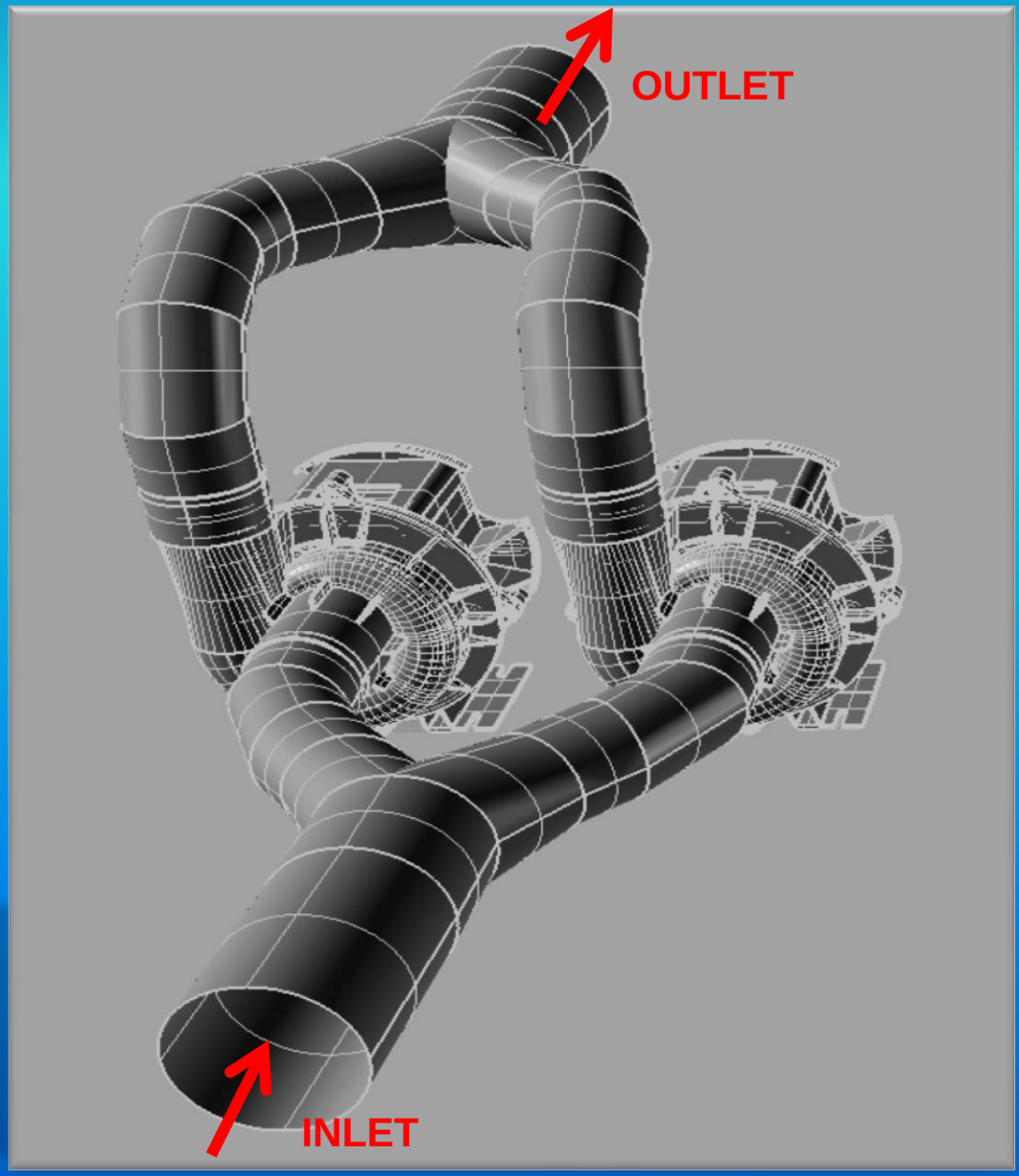
Q_{MAX} = 12.000 l/h
h_{MAX} = 2.80 m
Power = 115 W

The impeller chamber can be easily rotated to facilitate positioning of the pump



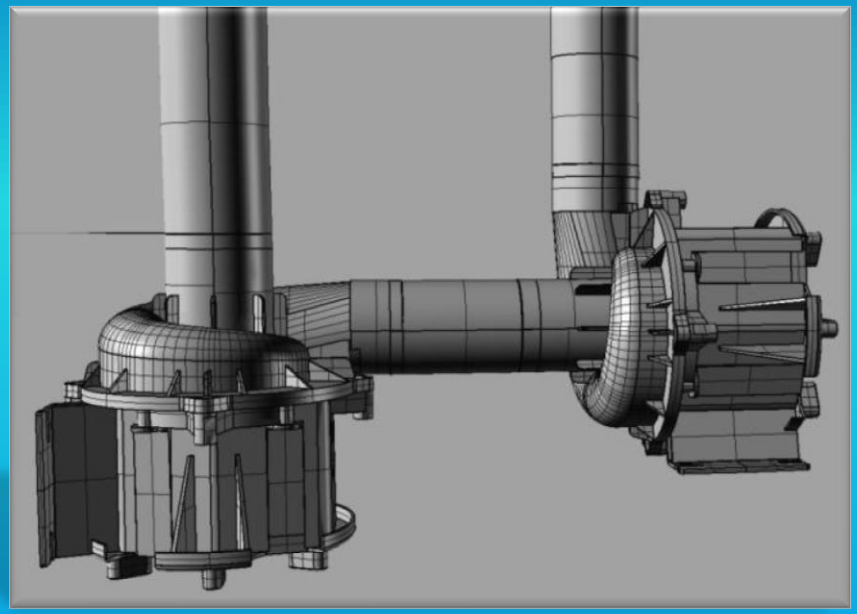
The AXiaL pumps can be easily used in **parallel**.
Result: Q_{MAX} = 40.000 l/h

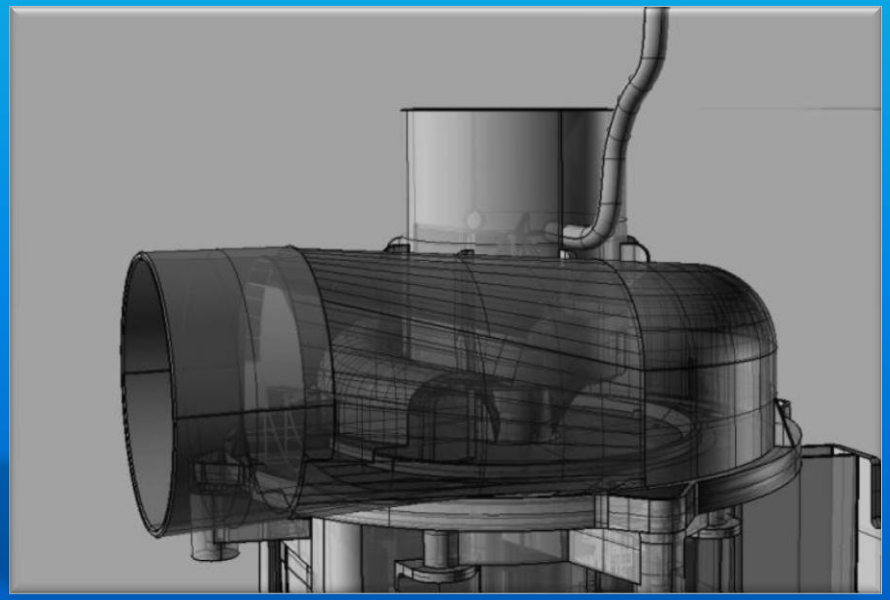
In the picture, two axial pumps were put in parallel through a simple circuit formed by tubes.



They can also used:

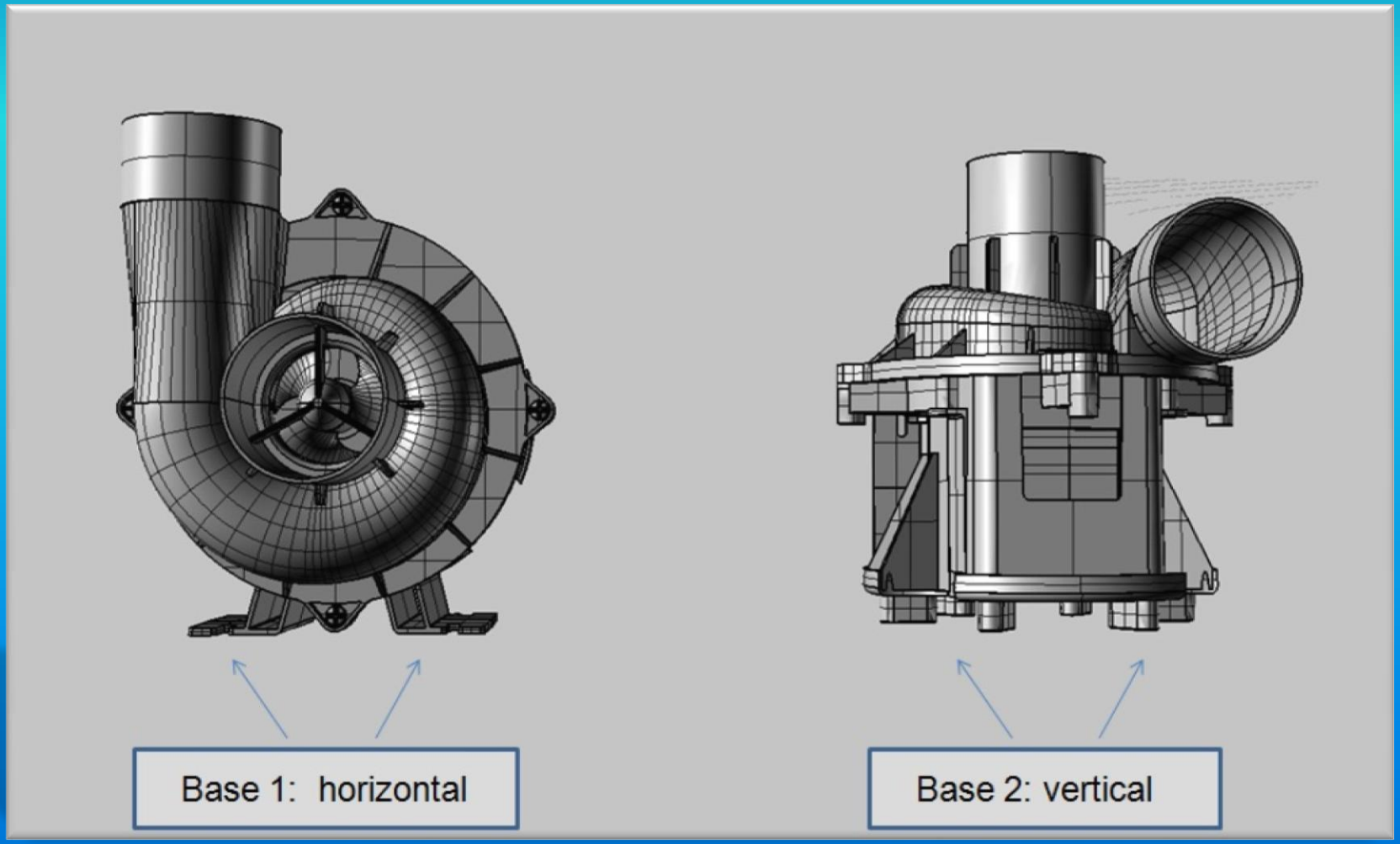
- In **series**, thus doubling the maximum head (h_{MAX} = 3,8m).





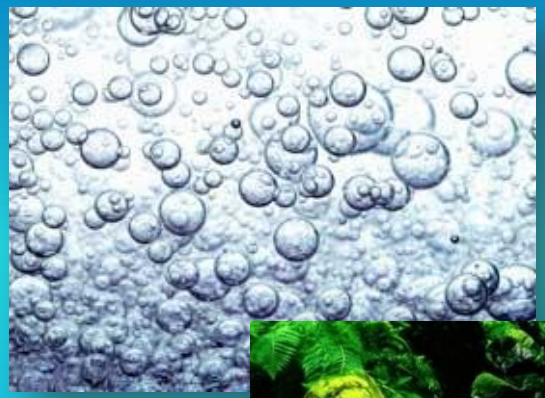
- With a **venturi** placed in the inlet to oxygenate the water.

The pump has 2 positions:



It can easily be placed in all situations of use

Application examples



Moving and oxygenation water

Waterfall and stream

Fish Farming

Water filtration

THE END