

Axial flow pumps or propeller pumps allow fluid to enter the impeller axially.

They discharge fluid nearly axially, pumping the liquid in a direction that is parallel to the pump shaft. An axial flow pump is also called a propeller pump because the impeller works much like the propeller of a boat. The propeller is driven by a motor that is either sealed directly in the pump body or by a drive shaft that enters the pump tube from the side.

Axial flow pumps use the propelling action of the impellers vanes on the liquid to develop pressure.

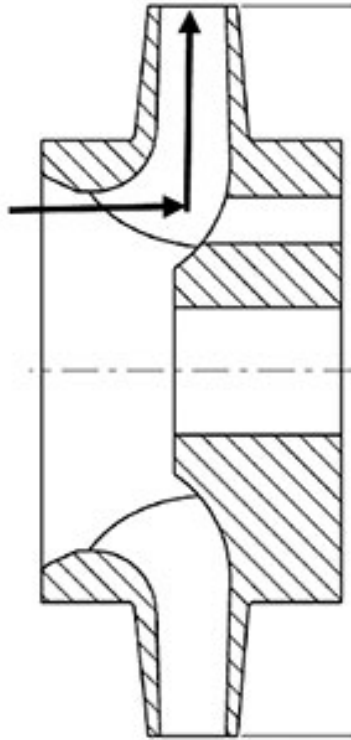
Axial flow pumps are frequently used in industrial settings as circulation pumps that work in conjunction with sewage digester or evaporators. Axial flow pumps are also used in the heat recovery systems, nuclear reactor water circulation, and high volume mixing applications, axial flow pumps can also be used as a liquid pump for ballast control in marine application.

Axial flow pumps use the propeller action to draw water into the pump by suction. An axial flow pump can be designed as a suction pump that draws water in through one end and discharges it out the top of the pump. However, axial flow pumps are not typically used for suction lift application.

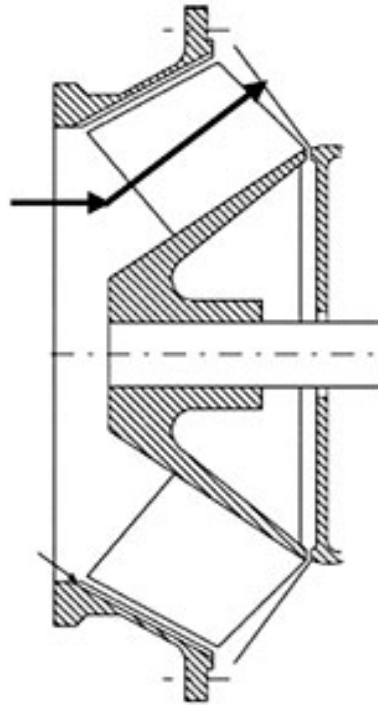
Axial flow pumps used for pumping clear water or storm water may also be submersible. A submersible pump that uses an axial flow design is common in irrigation and drainage application. Axial flow pumps may also be used as a sump pump in some industrial applications to circulate slurries or wastewater or to drain storm water from sump pits or waste storage lagoons.

Axial flow pumps are typically used in high flow rate, low lift application. A mixed flow pump similar to a turbine pump may be used as a well pump provided the well is not too deep.

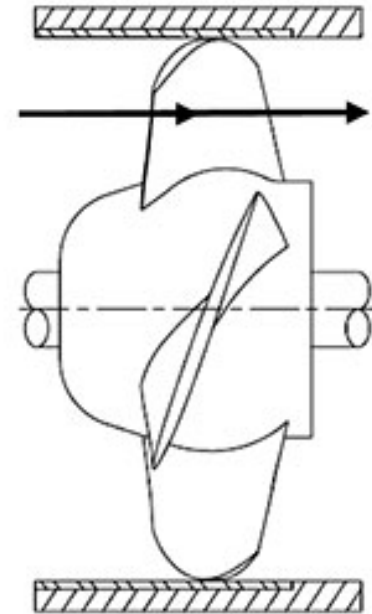
Radial flow



Mixed flow

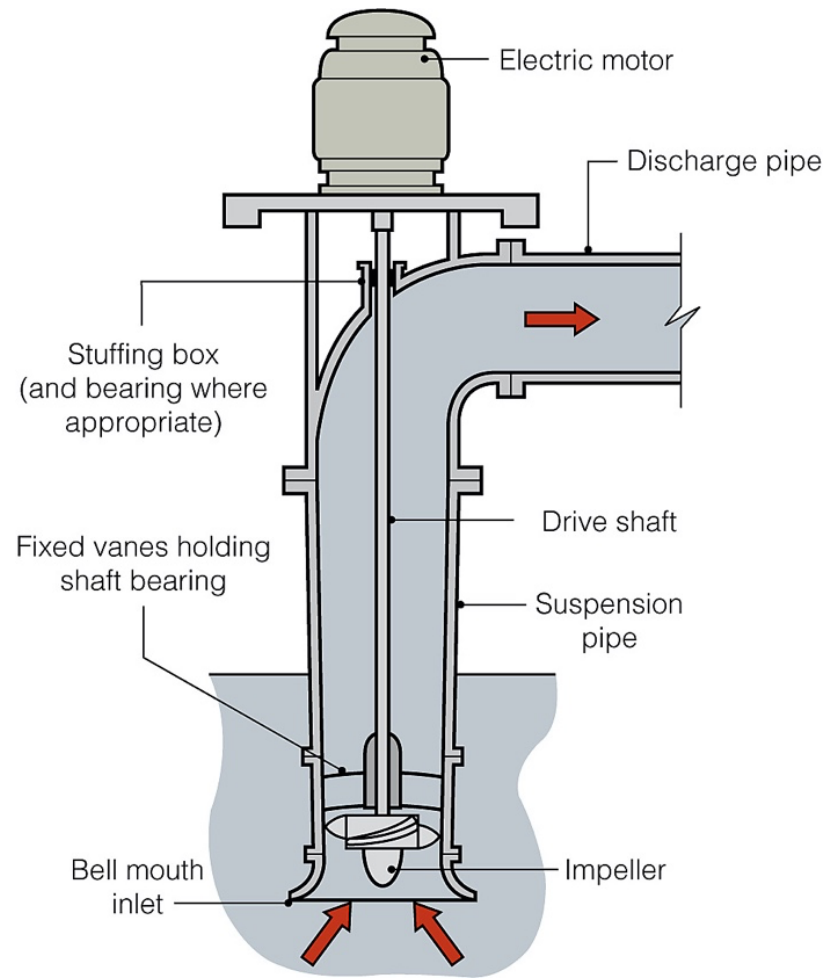


Axial flow

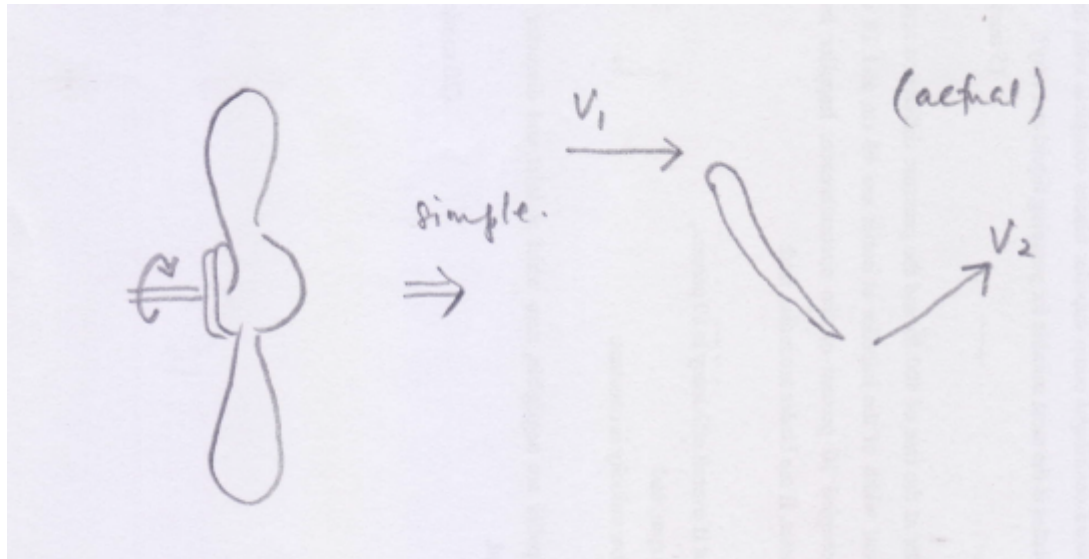




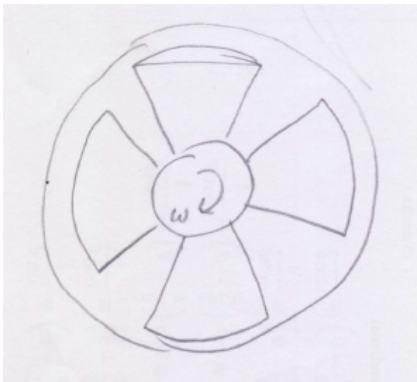




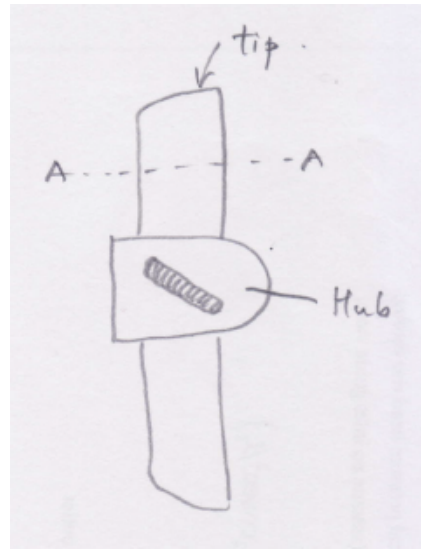
Axial pump or propeller pump



Pandangan depan



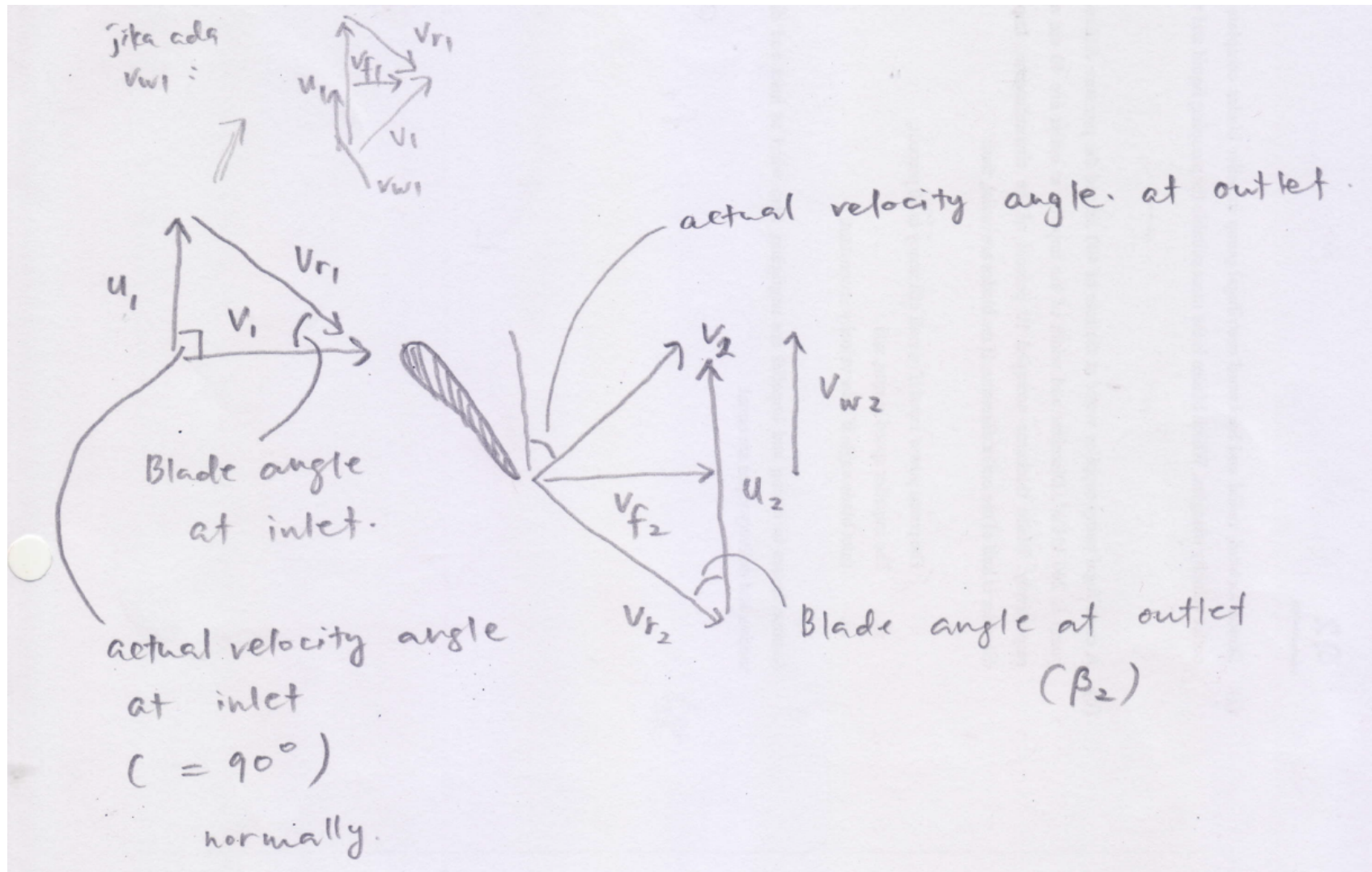
Side view



Top view for cross-sectional A-A



Velocity triangles



Velocity

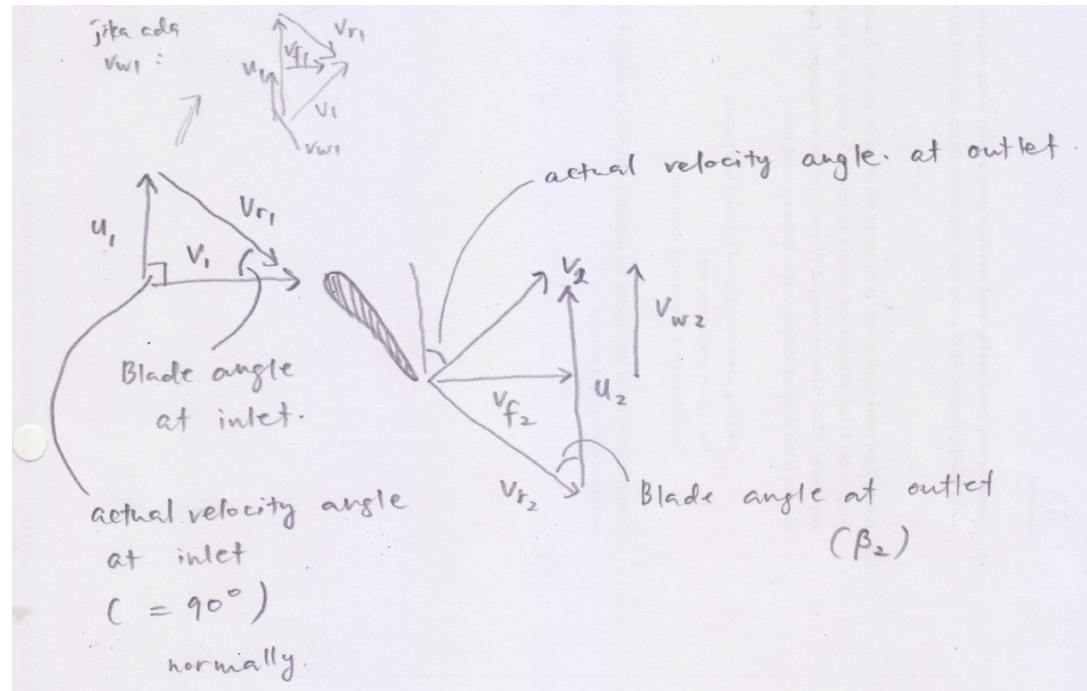
$$v_1 = v_f$$

$$v_{w1} = 0$$

$$u_1 = u_2 = u_3 = r\omega$$

$$v_{f1} = v_{f2} = v_f$$

$$\dot{m} = \rho A v = \rho \pi (R_2^2 - R_1^2) v_f$$



Euler head for axial pump

$$H_E = \frac{1}{g} (u_2 v_{w2} - u_1 v_{w1})$$

Assume that $v_{w1} = 0$

$$H_E = \frac{1}{g} (u_2 v_{w2}) = \frac{1}{g} u_2 \left(u_2 - \frac{v_{f2}}{\tan B_2} \right)$$

Efficiency of axial pump

$$\eta_{overall} = \frac{P_{out}}{P_{in}} = \frac{\rho g Q H_m}{P_{in}}$$

$$\eta_{mano} = \frac{P_{out}}{P_{in}} = \frac{\rho g Q H_m}{\rho g Q H_E} = \frac{H_m}{\frac{1}{g} u_2 v_{w2}} = \frac{g H_m}{u_2 v_{w2}}$$

