

# Design & Development of Floating Vertical Submerged Pump with Crusher & Aerator by Remote Control Motion

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**Abstract**— Research involves design and development of floating for vertical submerged pump with crusher. For this Research pump which is partially submerged in liquid and crusher is placed at bottom face area of pump by extending shaft from impeller is used. Crusher is used for homogenous mixing of thick (solid) sludge and liquid before lifting from pump. Floating is required to float the pump on liquid and move the pump at different direction and different location in lagoon. Generally in case of sugar factory, thick sludge is settle down at lagoon bottom due to this lagoon capacity gets decrease. In such condition pump is move in lagoon at different direction and location with the help of floating and make the homogenous mixing of sludge and water by using crusher. Floating pump is very useful to increase capacity of lagoon and make homogenous mixing of sludge and liquid at minimum cost.

**Key words:** Submerged Pump, Remote Control Motion, Crusher & Aerator

## I. INTRODUCTION

A pump is defined as a device which transfers the input mechanical energy of a motor or of an engine into pressure energy or kinetic energy or both of a fluid. In simple way pump is a device which converts the mechanical energy into hydraulic energy of fluid. The combined pumping and driving motor unit is known as hydraulic pump. The amount and direction of fluid flow is controlled by some external mechanisms.

The mechanical energy is converted into pressure energy by means of centrifugal force acting on the fluid; the hydraulic device is called as centrifugal pump. The centrifugal pump works on the principle of forced vortex flow which means that when a certain mass of liquid is rotated by an external torque, the rise in pressure head of the rotating liquid takes place. The fluid enters the pump impeller along or near to the rotating axis, accelerates in the propeller and flung out to the periphery.

Vertical submerged pump is a one type of axial flow centrifugal pump. In axial flow pumps the direction of flow of liquid through its impeller is in the axial direction only from inlet to outlet. These pumps are designed for very high discharge rates at low head; hence these are ideally suited for irrigation purpose. The vertical submerged pump is partially submerged in liquid. It is designed for quick and simple installation, easy maintenance and smooth operation. These pump products offer versatility and performance. The minimum operating temperature for all pump is 0°C (32°F) and the maximum operating temperature for all pumps is 150 0C (182 0F). Vertical submerged pump for the research has been used. In many of sugar industries for proper or homogeneous

mixing of molasses and sugarcane syrup axial flow are mostly preferred. We know the function of pump is to lift a quantity of liquid from a low level to high level. Vertical submerged pump is a one type of centrifugal pump. If the mechanical energy is converted into pressure energy by means of centrifugal force acting on the fluid, the hydraulic device is called as centrifugal pump. It is also called as velocity pump.

Crusher is mechanical device, with different shaped blades that turn on a shaft. For research purpose a special design of crusher is used. This is used in domestic mixture. Crusher is placed to the impeller by using extended shaft and cutter is attached to crusher's blade. The whole assembly of crusher and cutter is connected to pump casing bottom face area. This special design crusher is used for agitator purpose and proper (homogeneous) mixing of thick sludge and liquid before lifting of liquid from pump. Crusher is rotate as same speed of motor because we attached crusher to pump by extending shaft of motor.

Aeration systems normally perform two functions in activated sludge wastewater treatment processes, namely, oxygen transfer and mixing. While oxygen transfer may be regarded as the primary function, mixing is also important to ensure a full utilization of the activated sludge reactor volume and a uniform dispersion of dissolved oxygen throughout the mixed liquor. However, in some applications of the activated sludge process, a mixing input is provided which is independent of the aeration system, there by relieving the aeration system of its mixing function. Various features that vertical submerged pump possesses are, its discharge capacity is much higher, it can used for highly viscous fluids like muddy, oils, sewage water, chemical and paper pulp less, It is compact, smaller in size and has the low weight for the same discharge capacity, Maintenance cost comparatively very low, It is partially submerged type of pump, Sustained high efficiency, No separate lubrication system, Low noise and vibration levels, Quick and easy installation. Table 1 shows specification of the motor used.

Sr. No.	Particulars	Quantity
01	Speed	2008rpm
02	Voltage	415V
03	Head	2m
04	Discharge	40 Lpm
05	Power Factor	1

Table 1: motor Specification



Fig. 1:

**A. Process Chart for Cylindrical Float**

Component name : Cylindrical float  
 Drawing no. : 01  
 Raw material : PVC  
 Raw material size : 750 × 160 mm  
 Final dimension (mm) : 700 × 160  
 Quantity : 02  
 Checking instrument : Measuring tape

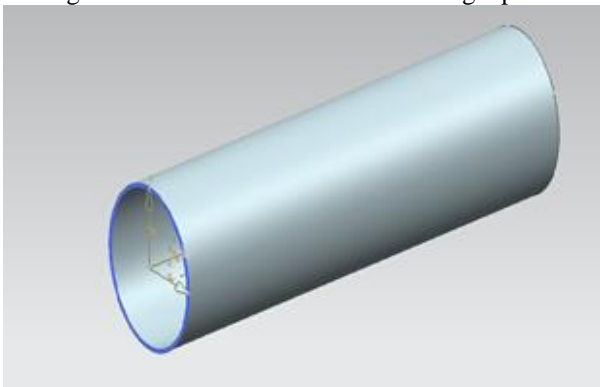


Fig. 2: Float Drawing

**B. Process Chart For Cylindrical Float:-**

Component name : cylindrical float  
 Drawing no : 02  
 Raw material : PVC  
 Raw material size : 550 × 160 mm  
 Final dimension (mm) : 500 × 160  
 Quantity : 02  
 Checking instrument : Measuring tape

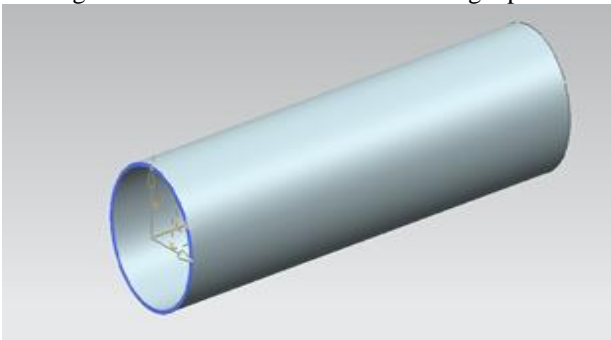


Fig. 2: Float Drawing

**C. Process Chart For Holding Plate:-**

Component name : Holding plate

Drawing no : 03  
 Raw material : mild steel  
 Raw material size : 240 × 250 × 4mm  
 Checking instrument : Vernier calliper  
 Quantity : 02

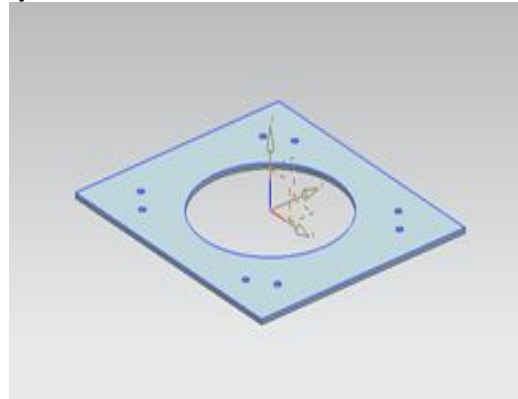


Fig. 3: Float Drawing

Table 2 shows the process chart for plate

Sr.no	Operation	Machine	Initial dimensions	Final dimensions
1	Cutting	Power cutter1	240×250	228×203
2	Facing	Lathe machine	228×03	225×200
3	Drilling	Drilling machine	Ø130	Ø130
4	Drilling	Drilling machine	Ø6	Ø6
5	Facing (side edges)	Lathe machine	228×203	225×200

Table 2: Chart for Plate

**D. Process Chart for Metal Strip**

Component name : Metal strip  
 Drawing no : 02  
 Raw material : Mild steel  
 Raw material size : 180 mm  
 Quantity : 04  
 Checking instrument : Vernier calliper

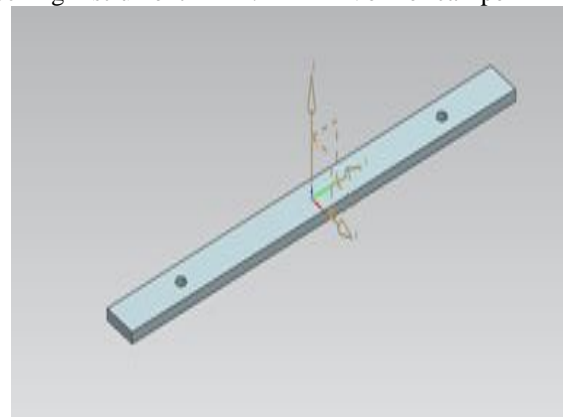


Fig. 4: Metal Strip Drawing

Table 3 shows the process chart for Strip

Sr.no	Operation	Machine	Initial dimensions	Final dimensions
1	Cutting	Power cutter	270×2×4	260×2×4

2	Facing	Lathe machine	260×2×4	250×2×4
3	Drilling	Drilling machine	Ø6	Ø6

Table 3: Process Chart for Strip

## II. ASSEMBLY OF PARTS

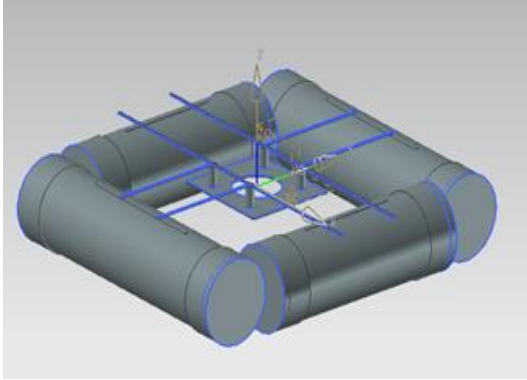


Fig. 5: Float Assembly in 3D View



Fig. 6: Crusher

### A. Specification Of Crusher

Diameter of cutter	:	70mm,
No. of blades	:	6,
Speed	:	2800 rpm,
Rod length	:	50mm,
Material	:	stainless steel.



Fig. 6: Assembly of crusher with Vertical Submerged Pump

## III. MOTION BY REMOTE CONTROL



Fig. 9: Submersible pump

### A. Application of Submersible Pump

Submersible pumps are found in many applications. Single stage pumps are used for drainage, sewage pumping general industries pumping and slurry pumping they are also popular with pond filters and. Multiple stages submersible pumps are typically lowered down a borehole and most typically used for residential, commercial, municipal and industrial water extraction water wells and in oil wells. Other uses for submersible pumps include sewage treatment plants, sea water, handling, firefighting (since its film retarded cable) water well, the and deep well drilling, irrigation systems. Special attention to the type of submersible pump is required when using certain types of liquids. Pump used for combustible liquids or for water that may be contaminated with combustible liquids must be designed not to ignite the liquid or vapours.

## IV. CONCLUSION

By using Floating vertical submerged pump with aerator the sludge or slurry containing organic compounds or harmful gases can be easily eliminated in Effluent Treatment Plant. Basically in earlier Floating vertical submerged pump the aerator concept was not used so further by using aerator in pump the sludge or slurry containing organic compounds or harmful gases can be easily eliminated in Effluent Treatment Plant.

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