

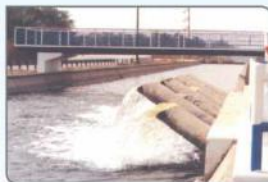
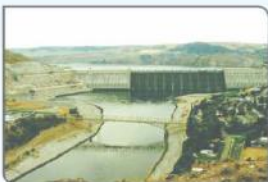


# SUBMERGED CENTRIFUGAL PUMPSETS (SCF) ...ARS & ARSDS

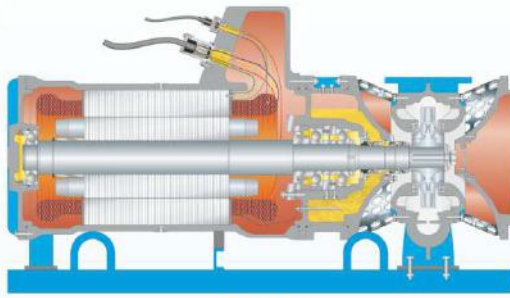
*Combines the Efficiency of VT,  
Reliability of Induction Motors &  
Familiarity of Centrifugal Pumps;  
all in a Maintenance Free, Submerged  
Monoblock Enclosure*



*Space Saving,  
Ultra Low Maintenance,  
Energy Saving &  
Low Life Cycle Cost (LCC)...*

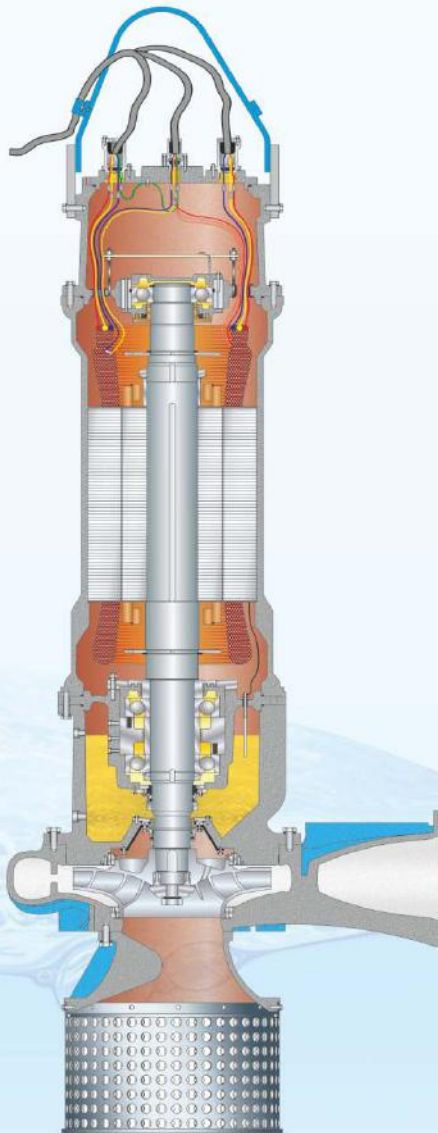


**Design**



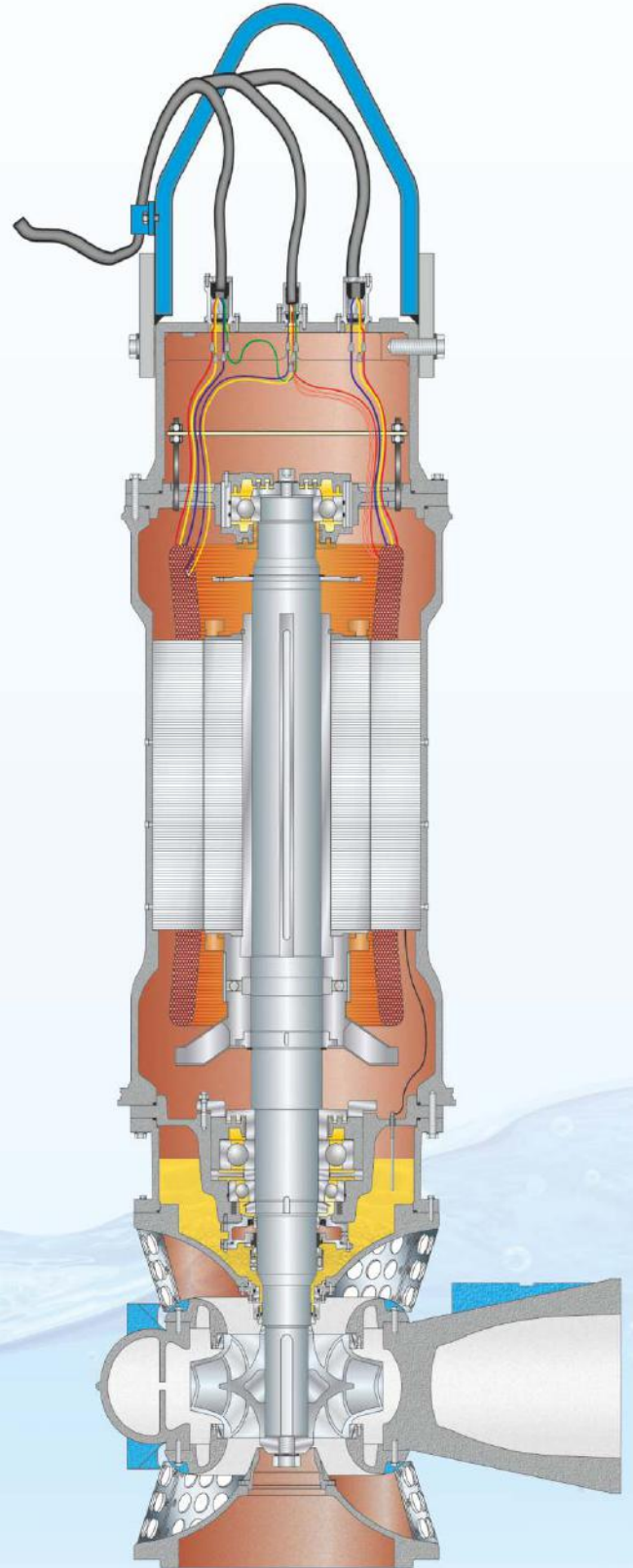
**ARSDS**

Low Flow, Medium to High Head;  
**Double** Suction SCF Pumpset  
 (3000rpm) (Horizontal Only)



**ARS**

Medium Flow, Medium to High Head;  
**End** Suction SCF Pumpset  
 (3000, 1500, 1000 & 750 rpm)

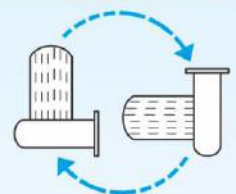


**ARSDS**

High Flow, Medium to High Head;  
**Double** Suction SCF Pumpset  
 (1500, 1000 & 750 rpm)



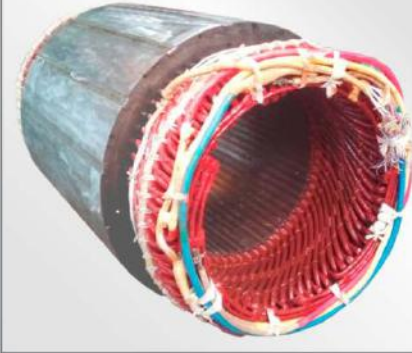
**Most Pumpset Models** (upto 650kW 4P, 500kW 6P & 400kW 8P; except for 3000rpm Pumpsets) may be used either **Vertically** or **Horizontally** (to tackle Unforeseen Site Constraints)



## Design : MOTOR END

The Totally Enclosed, Self Water Cooled [TESWC IC-4A1W0 to IEC/IS-60034\_6] motor is similar to Dry Type Induction Motor, the major difference being the Degree of Protection - it is of **IP-68** Enclosure – to ensure **Hermetic Sealing** (even under water immersion).

HT Motor



LT Motor



### Huge Reserve Margin

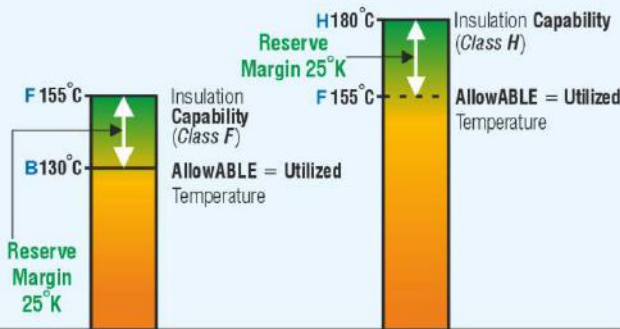
As a rule of thumb in Motor Industry (based on *Arrhenius Equation*); for every 10°C (or more precisely 10°K) Drop in Temperature, the useful Life of Insulation is Doubled.

Hence with a 50°K Reserve Margin (v/s just 25°K of Competitors); Aqua's (Motor {Stator Insulation}) will have a **6 times Higher Life** (than competitors)...!



Thanks to **generous Reserve Margins & Optimized Design**; Aqua's Motors keep coolly working even in scorching Indian summers.

### Bare Shaft Induction Motor

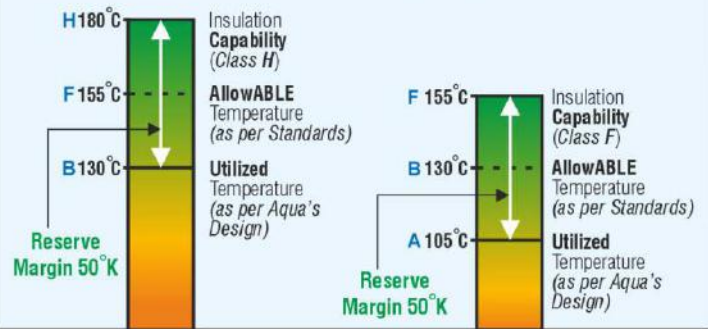


### Just 25°K Thermal Reserve Margin

Class "F" Insulation  
 x  
 Class "B" Utilization  
 Fully use up motor's reserve margin

Class "H" Insulation  
 x  
 Class "F" Utilization  
 Fully use up motor's reserve margin

### Aqua's TESWC Induction Motor



### 50°K Thermal Reserve Margin Leads to 6 times Higher Life. 😊

Option1 :  
 (Medium & Large LT Motors)  
 Class "H" Insulation  
 x  
 Class "B" Utilization

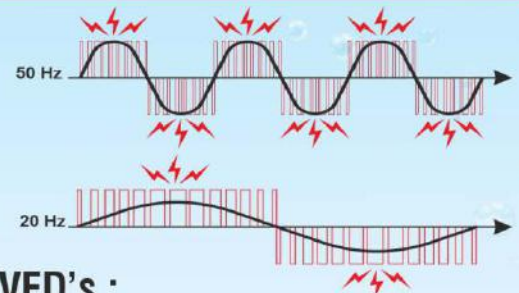
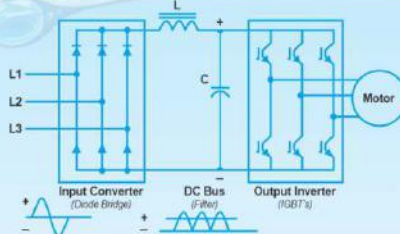
Option2 :  
 (HT & Smaller LT Motors)  
 Class "F" Insulation  
 x  
 Class "A" Utilization

Larger motors can be offered with **Ultra High Efficiency, Copper Bar Rotors** resulting in a **IE3 Equivalent Efficiency** even for H. T. Motor (at a price premium).



<b>IE2</b>	High Efficiency	✓	<b>STANDARD</b>
<b>IE3</b>	Premium Efficiency	✓	<b>OPTIONAL</b>

Option of IEC IE3 equivalent Motor Efficiencies is also available (at a price premium) even for HT Motors.

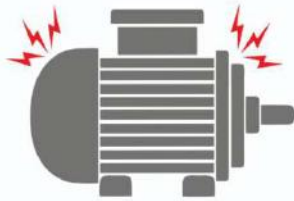


### ⚠ Side Effects of Speed Control of Pumpsets via VFD's :

- 1) Generate PWM Output with **High Harmonic Distortion** which causes **severe Di-Electric stress** (on Motor's Stator's Winding Insulation),
- 2) Excite Motor Stator - Rotor **Bearing Circulating Currents** (which flow through **NDE bearings**),
- 3) May cause **Shaft Vibrations & even Structural Resonance** (if the Critical Speed of the Shaft lies below the maximum speed) &
- 4) Reduce the Motor Speed which inturn **reduces the Volume Flow** of Motor **Fan's Cooling Air** (in TEFC, CACA, TETV type Air Cooled Motors) leading to Motor Stator **Winding OverHeating** (despite over all speed & kW reduction)...!



**VFD Compatible**



Thanks to Additional **Mica** (Over & Above Glass Fibre Aramid), + **Vacum Pressure Resin Impregnation (VPI)**; Aqua's Motor's **LT/HT Insulation** has **extremely High Motor Stator Winding Di-Electric Strength** enabling it to work satisfactorily even when fed by **VFD**.

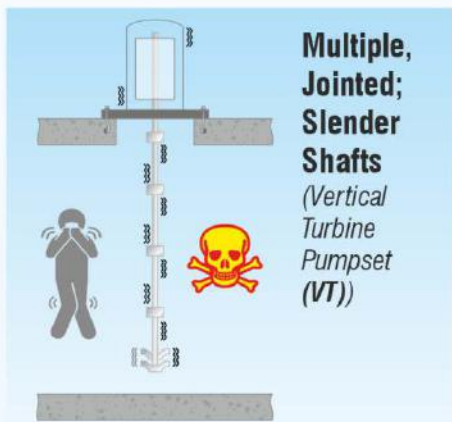


Larger motors are always offered with **Current Insulated NDE Bearing Housings**, reducing the risk of bearing failures arising from internal Rotor-Stator-Bearing Circulating Currents excited by **VFD's**.

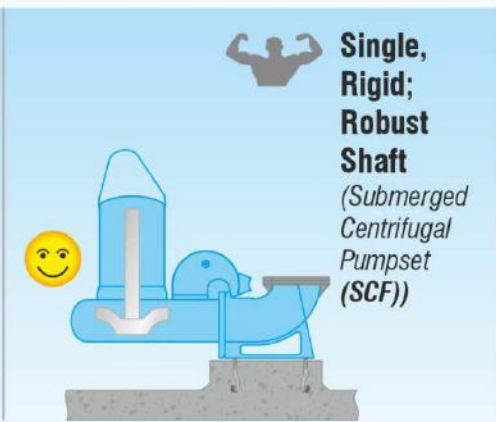
As the **motor** of Submerged Pumpsets itself is submerged in **water**, it is excellently **Cooled irrespective of the Motor Speed**.



Aqua's TESWC motor's Insulation is based on Globally Recognized, Resin Poor; Mica based; **Dual Vacuum Pressure Resin Impregnation VPI** Technology with Fungus & Moisture Repellent Top Coatings...



**Multiple, Jointed; Slender Shafts**  
(Vertical Turbine Pumpset (VT))



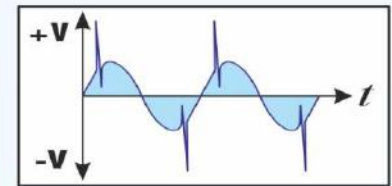
**Single, Rigid; Robust Shaft**  
(Submerged Centrifugal Pumpset (SCF))

As the **Critical Speed** of SCF Pumpsets lies Safely Above it's Maximum Speed, there is **No Risk of Structural Resonance or Excessive Vibration** (when speed is varied with VFD)

**Tolerates...**



... *Wide Voltage Variation*



... *Power Spikes & Surges*

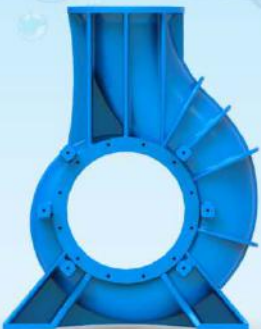
At **Non Drive End Bearing (NDE)**, we offer (at no extra cost) **Increased Internal Clearance Class Bearings** (for most models (larger than 15kW 2P, 30kW 4P & 40kW 6P}) for **Increased Safety** against **Accidental Dry Running**.



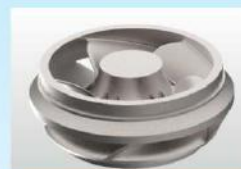
If Motor Submergence is not always possible, special Open/Closed circuit Jacketing system is provided (which uses a part of the pumped water to cool the motor) - i.e. It is a **Self Sufficient** Cooling system not requiring any additional Ancillaries.

**Design : PUMP END**

Pump Casing is of **Volute** type & Impeller (either End or Double Suction) is mounted **directly** on to the Extended Shaft of the motor hence **eliminating alignment & vibration problems**.



**Volutes** (for duty heads rated above 60m) are always **built with Ductile Iron** for added **Toughness**.



**End Suction Impeller**



**Double Suction Impeller**

CADesigned, CFD optimized; **Multi bladed Water Impellers** ensure **Superb Efficiency**.

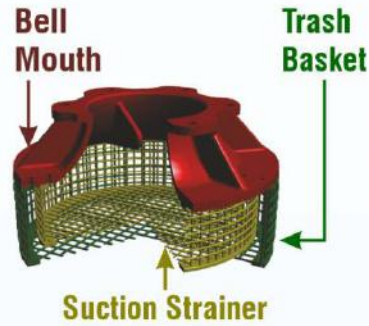
**Smart Set Hydraulics**

For **Restoration of Efficiency** (after prolonged usage), most models (except for 2P &/or Small kW rating motors) have **Replaceable** Wearing Rings.



**A Strong, Single Shaft**  
for Fail Safe Operation

Single, Robust & oversized Shaft is **Common** between the motor & pump. It is (upto 1550 kW 4P, 1200 kW 6P, 900 kW 8P) made from **Stainless Steel** & designed without Any Sleeves (below the Mechanical Seals) thereby reducing maintenance problems & **eliminating need of spare parts.**



Heavy Duty Suction Strainer (& Optional Extreme Duty **TRASH BASKET** (for End Suction types)) ensures fairly choke free pumping even in presence of **Weeds, Hyacinth, Plastics, Grass** etc.

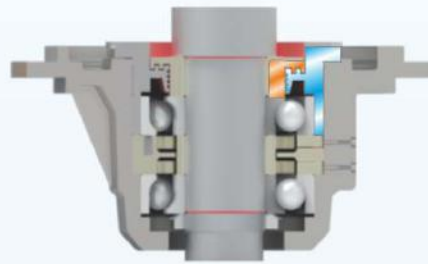
**Shaft Sealing** is by means of **Two**, Independent, high quality Bi-Directional; **Mechanical Seals** permitting reverse running due to accidental back-flow. The Primary seal is always of **Silicon Carbide** faces to withstand Erosion incase of increased silt content in water.



Seals are rated for at least **16 / 25 bar** pressure capability for **L10H** life in excess of **50,000 hours** &/or **5 years.**

All **Thrusts** are absorbed by **Grease Lubricated Anti Friction Bearings** located deep inside the motor & inherently **isolated from the pumped media** - this makes the **bearings fail proof** even in case of increased silt levels in Water.

**Superb Bearing Life**  
*thanks to Heavy Duty Designs*  
(upto Triplex arrangements are offered)



**Grease Sealing**  
(of Bearings)  
*by means of Sophisticated Labyrinth Seals*



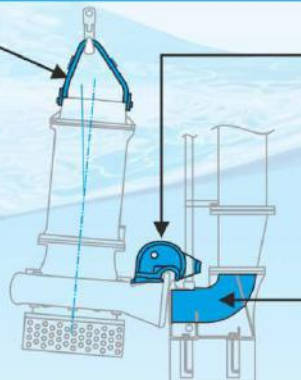
Anti Drip, Fully Synthetic; **Super Premium Synthetic Grease** ensures a minimum Regreasing Interval (**F<sub>10H</sub>**) of **75,000h** (for Pumpsets rated upto 650kW) & **45,000h** (for larger kW) Submerged motors



*Tribologically Optimized Bearing Components for Bullet Proof Reliability*

### Smart Lifting Handle

- **Simple** hoisting
- **Quick** Installation / Removal in One **continuous** action
- Allows '**Fishing**' of Pumpsets (even when Pumpset is Submerged under water & invisible to operator)



Auto-Coupling's **Bracket** withstand heavy Cantilever loads & hence always built with **Ductile Iron** (for added toughness & resistance to cracking).

High Head / Large Pumpset's Auto-Coupling's **Pedestal** are built with **Ductile Iron** (for added Toughness & resistance to cracking during **Water Hammer & Transient Pressure Surges**).

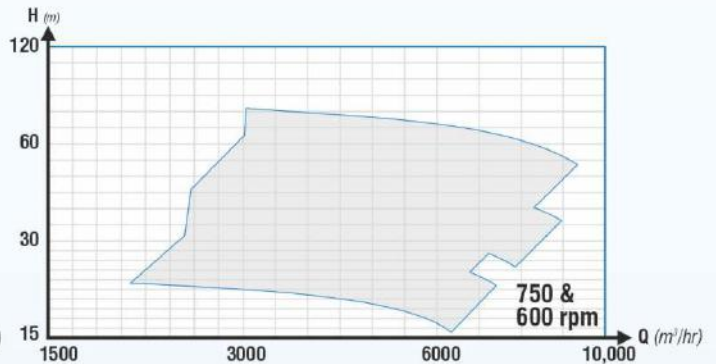
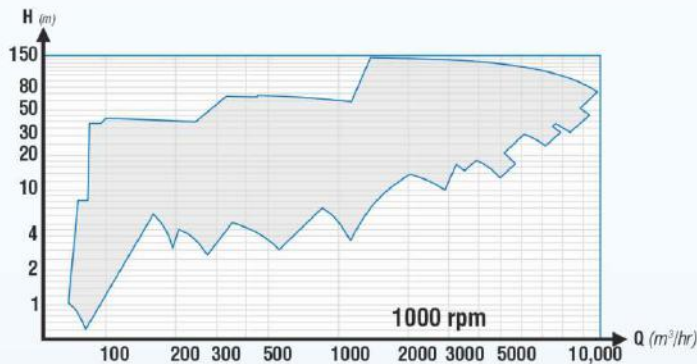
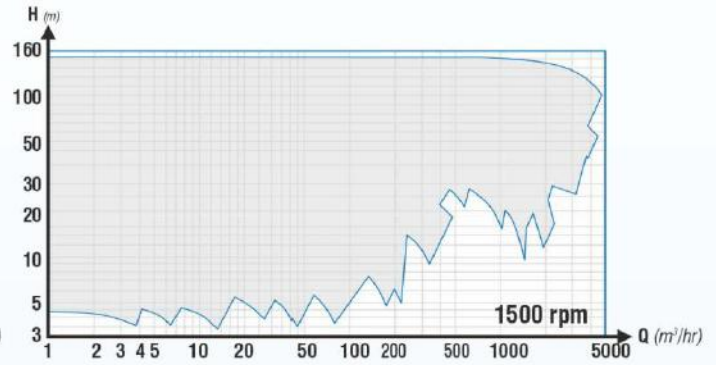
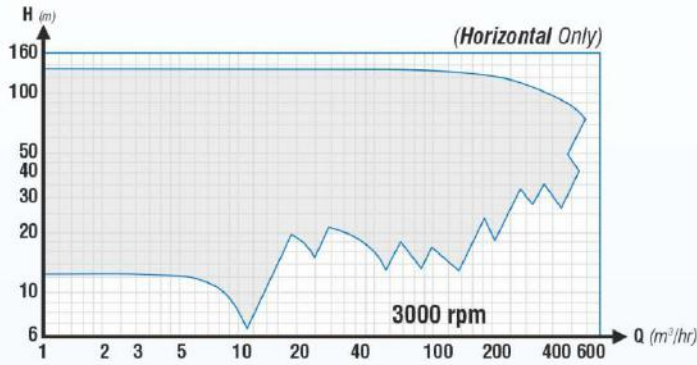
### Intelligent InBuilt Monitoring

Easy Monitoring (& Remote Control<sup>#</sup>) of your Pumpset's Health.

- **PSLD** detects Pressurized Water Leakage from Mechanical Seals.
- **CCWLD** detects Accidental Water Leakage from Cable Sheath's Cuts &/or Nicks into the Motor.
- **SBWLD** detect Accidental Water Leakage in to Motor's Stator Chamber.
- **BTDs** in the form of Bi-metallic Switches (for All Pumpsets) & RTD's (PT100 - 3 Wire Simplex type - from Size > 150kW) to Monitor Bearing Temperature (without any Additional Cost)<sup>#</sup>.
- **WTDs** in the form of Bi-metallic Switches (for All Pumpsets) & RTD's (PT100 - 3 Wire Simplex type - 1 per each Phase - from Size > 150kW) to Monitor Winding Temperature (without any Additional Cost)<sup>#</sup>.

<sup>#</sup>requires additional communication hardware

## Typical Performance Range



### Standard Technical Specification

Pump	Discharge Sizes	DN 40 to 800mm
	Flow Rate	Upto 9000 m <sup>3</sup> /hr
	Head	Up to 130m
Motor	Ratings	2kW to 2500kW
	Speeds	3000, 1500, 1000, 750, 600, 500 & 400 rpm ( <i>synchronous</i> )
	Duty & Enclosure	S1 & Exceeding IP 68
	Supply Options	3Ø; 415V, 550V, 690V, 3300V, 6600V, 11000 V
Intelligent InBuilt Monitoring	Primary Seal Leakage Monitoring (PSLD)	By built in Detection System
	Cable Connection Chamber Water Leakage Detector (CCWLD)	Available from size 200kW & above
	Winding Temp Detector (WTD)	Available by default by Bimetallic Switches in each phase (PT100 optionally available for sizes 150kW & above)
	Drive End Bearing Temperature Detector (BTD) (DE)	Available by default by Bimetallic Switches from size 22 kW & above (PT100 optionally available for sizes 150kW & above)
	Non Drive End Bearing Temperature Detector (BTD) (NDE)	Available by default by Bimetallic Switches from size 22 kW & above (PT100 optionally available for sizes 150kW & above)
	Stator Chamber Water Leakage Detector (SBWLD)	Available from size 22 kW & above

### Material of Construction (MoC)

		Option 1	Option 2
Pump Casing		Grey Cast Iron ( <i>Only for Low &amp; Med. Head</i> )	Ductile Iron ( <i>for High Head</i> )
Wearing Ring (Casing)		Bronze	Stainless Steel
Impeller		Stainless Steel	
Shaft		Stainless Steel	
Motor Casing & Other parts		Grey Cast Iron	Stainless Steel
Motor Squirrel Cage Rotor Bars		Aluminum bar	Copper bar
Motor Jacket Casing (If)		Mild Steel	Stainless Steel
Cables		PVC insulated, Copper Cored	ERPS insulated, Copper Cored
Mechanical Shaft Seals	Secondary (Motor Side)	Carbon (B) v/s Cast Chrome Molybdenum steel (S) with Viton (FKM) elastomers	SiC v/s Carbon with Viton (FKM) elastomers
	Primary (Pump Side)	Silicon Carbide v/s Silicon Carbide (SSiC) with Nitrile (NBR)	
Fasteners ( <i>Expose to Liquid</i> )		Stainless Steel (A2 - SS304)	Stainless Steel (A4 - SS316)
Oil		Eco friendly Paraffin White Oil to ISO VG 15	
Auto Coupling	Pedestal	Grey Cast Iron ( <i>Only for Low &amp; Med. Head</i> )	Ductile Iron ( <i>for High Head</i> )
	Bracket	Ductile Iron	
Portable Base Frame		MS Fabricated	

## Concept Benefits

**Saves (upto 55%) Land Requirement\***

**Saves (upto 45%) Capital Cost of Entire Pumping Stations\***

**Saves (upto 75%) Spare Parts & Consumables\***

**Saves (upto 66%) O&M Staff\***

**Low Energy Cost :** Due to Elimination of Suction Losses, Ancillary & Auxiliaries; **Wire to Water Power Consumption** of SCF based Pumping Station is **slightly Lower** (compared to Conventional Bare Shaft Pump - Motor Set based Pumping Stations).\*

**No need of Valve Opening / Closing (during Pumpset Start / Stop)**

**No need for Frequent Periodic....**  
**Aligning / Replacing Shafts/Sleeves &/or Coupling**    **Adjusting / Replacing Gland Packing**    **Refilling Oil &/or Grease**

**User Friendly**

- No risk of Cavitations.
- No damage due to Flood or Rains.



**Requires No Special Pre – Post / Ancillary-Auxillary Operations;** like :

- Operating & Maintaining the Forced Water Lubrication systems operation,
- Operating the De-watering Pump to water leakage from Seepage / Gland Piping Leakage, etc.

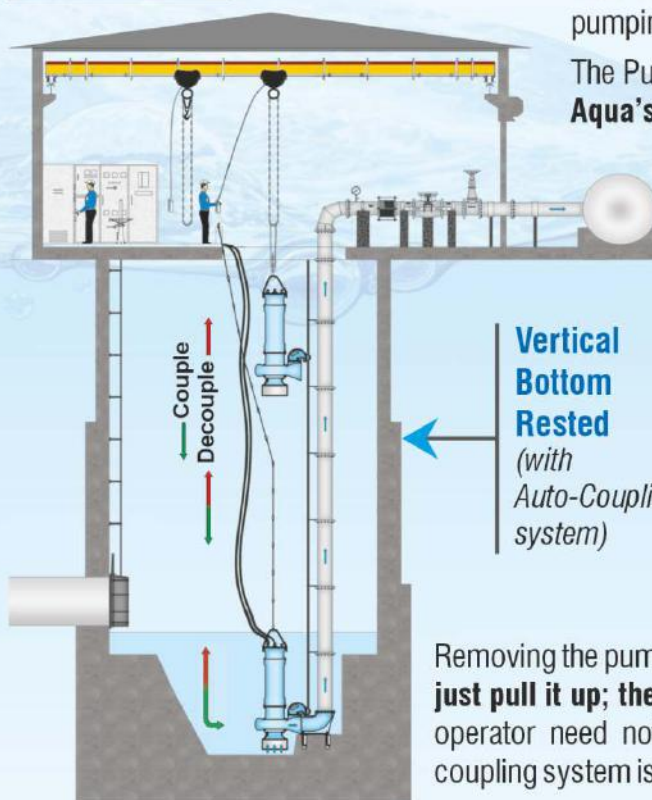
**Minimal Noise, Vibration & Heat Emission;** due to **elimination** of Auxiliary & Ancillary systems (like Forced Water Lubrication, Thrust Bearing Cooling system, Motor Heat Exchanger).



**Low Life Cycle Costs (LCC)\***

\* (refer [marketing@aquapumps.com](mailto:marketing@aquapumps.com) for additional white papers)

## Installations



This represents the **most Economical & most User-friendly** pumping station design.

The Pumpset is installed directly at the bottom of the wet pit using **Aqua's Automatic Coupling System**. This system ensures that the Pumpset is properly Lowered (& firmly connected to the discharge piping) or Lifted out (disengaged from discharge piping) in a **simple, precise & within minutes...!**

It uses Guide Rails (which guide the pumpset correctly downwards) till its discharged flange matches that of the auto coupling pedestal.

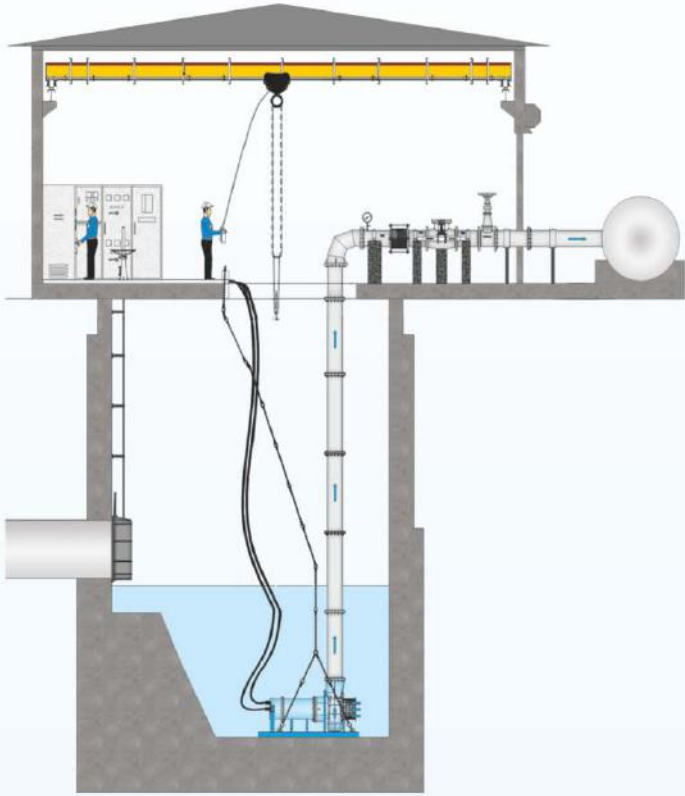
The contacting surfaces are well machined & designed such that the weight of the pumpset & wedge design of auto-coupling ensure a leak-free joints.

The pumpset is kept in place by its weight - **there is no need for any fastening of Bolt-Nut** to clamp it to the delivery piping.

Removing the pumpset for maintenance is equally simple - **just pull it up; there are no bolts to be dismantled**. The operator need not enter the sump once the automatic coupling system is fitted.



*Minimum Operational Hassles...*



**Horizontal Bottom Rested with Portable Base Frame**  
*(For Shallow, Clear Water Sumps)*



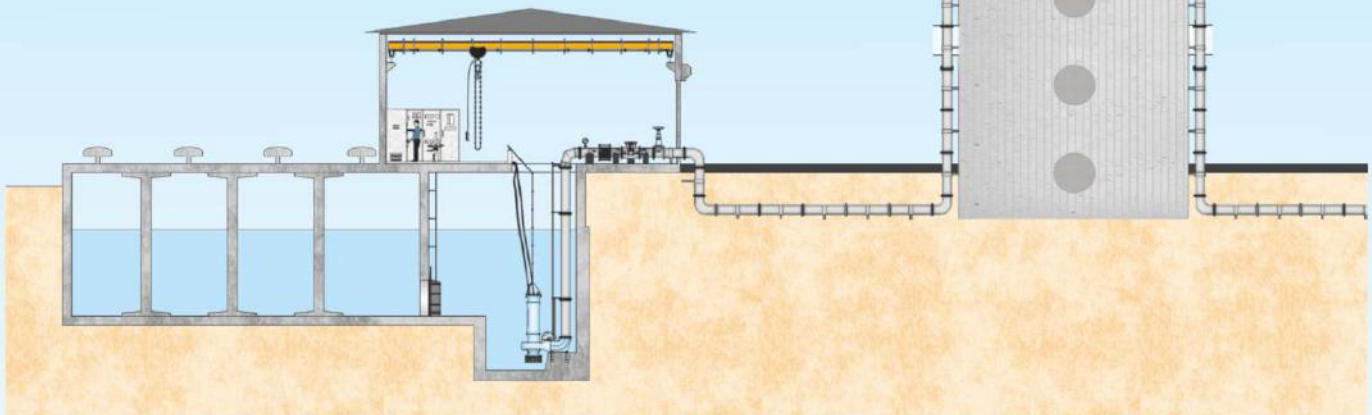
**Horizontal or Vertical Suspended**  
*(on Floating Pontoon in Water Body)*

**Applications**

**Drinking Water Distribution**

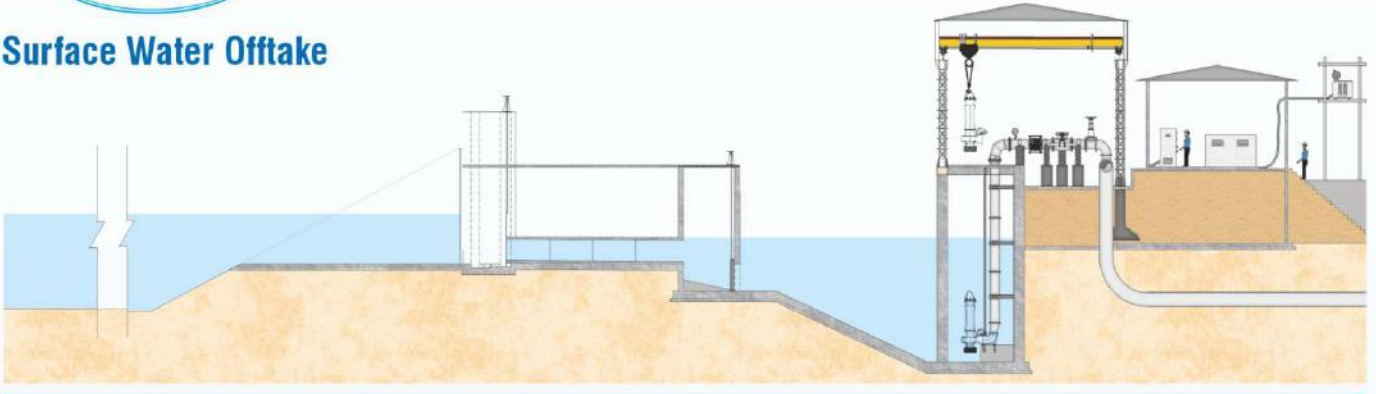


*Ultra Compact Pump Room Saves Precious Land*

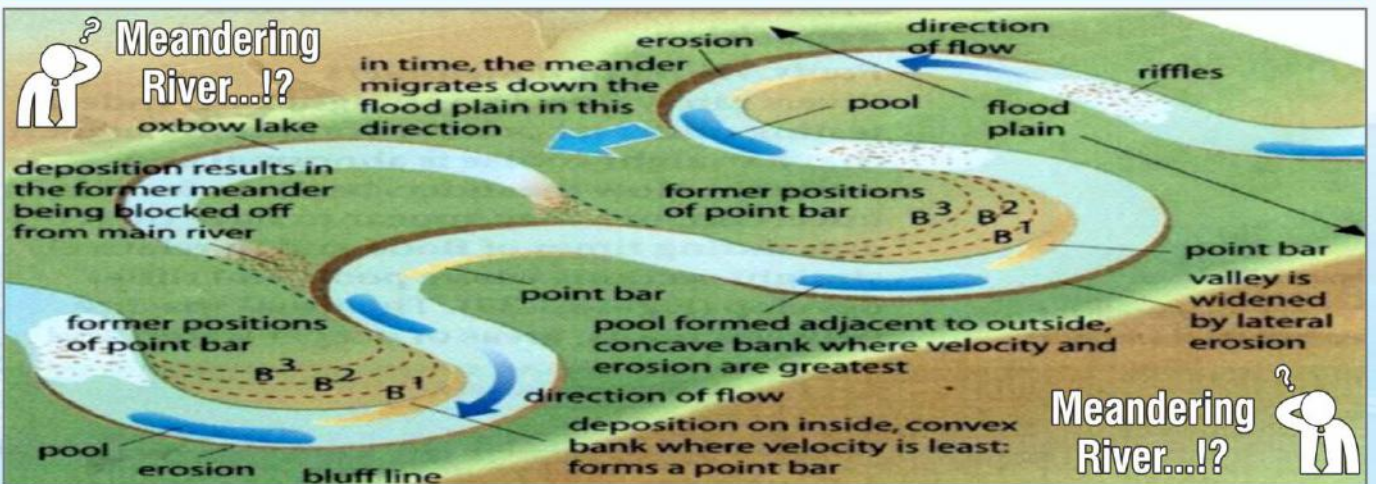
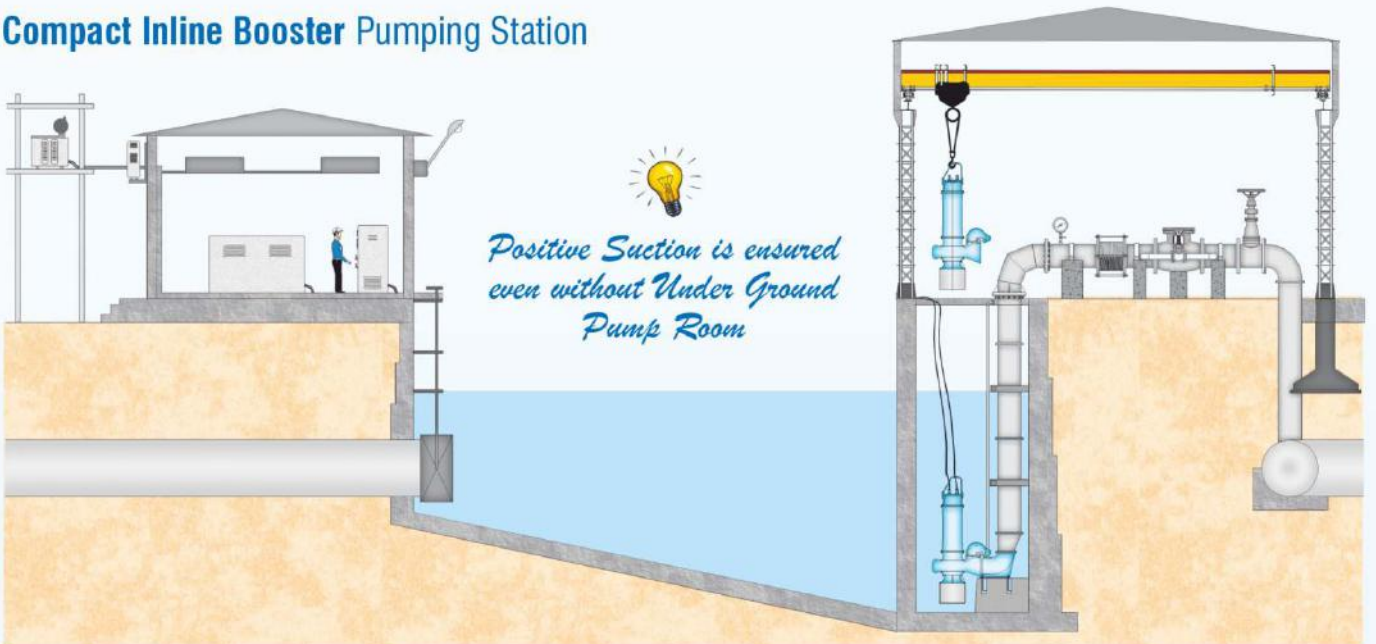




## Surface Water Offtake



## Compact Inline Booster Pumping Station



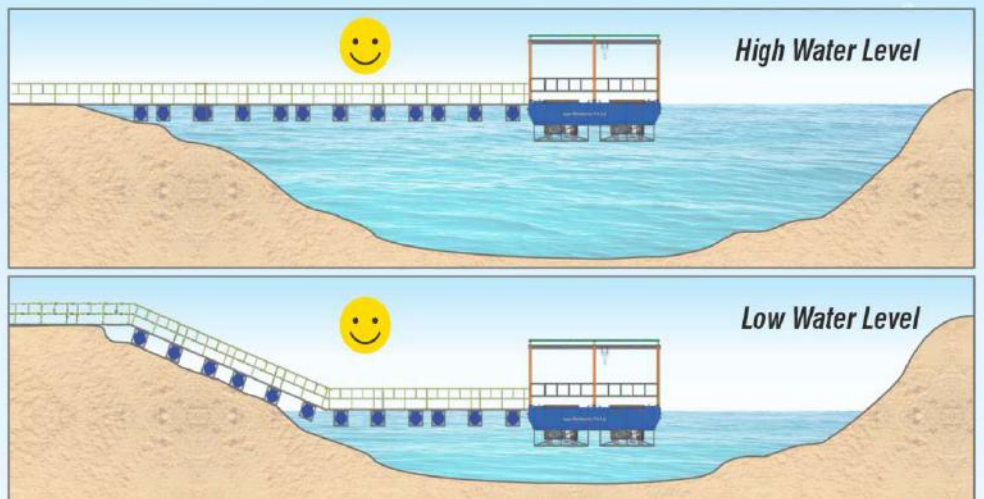
## Floating Pontoon Pumping Station

Water Supply is **assured, Round the Year**; irrespective of :

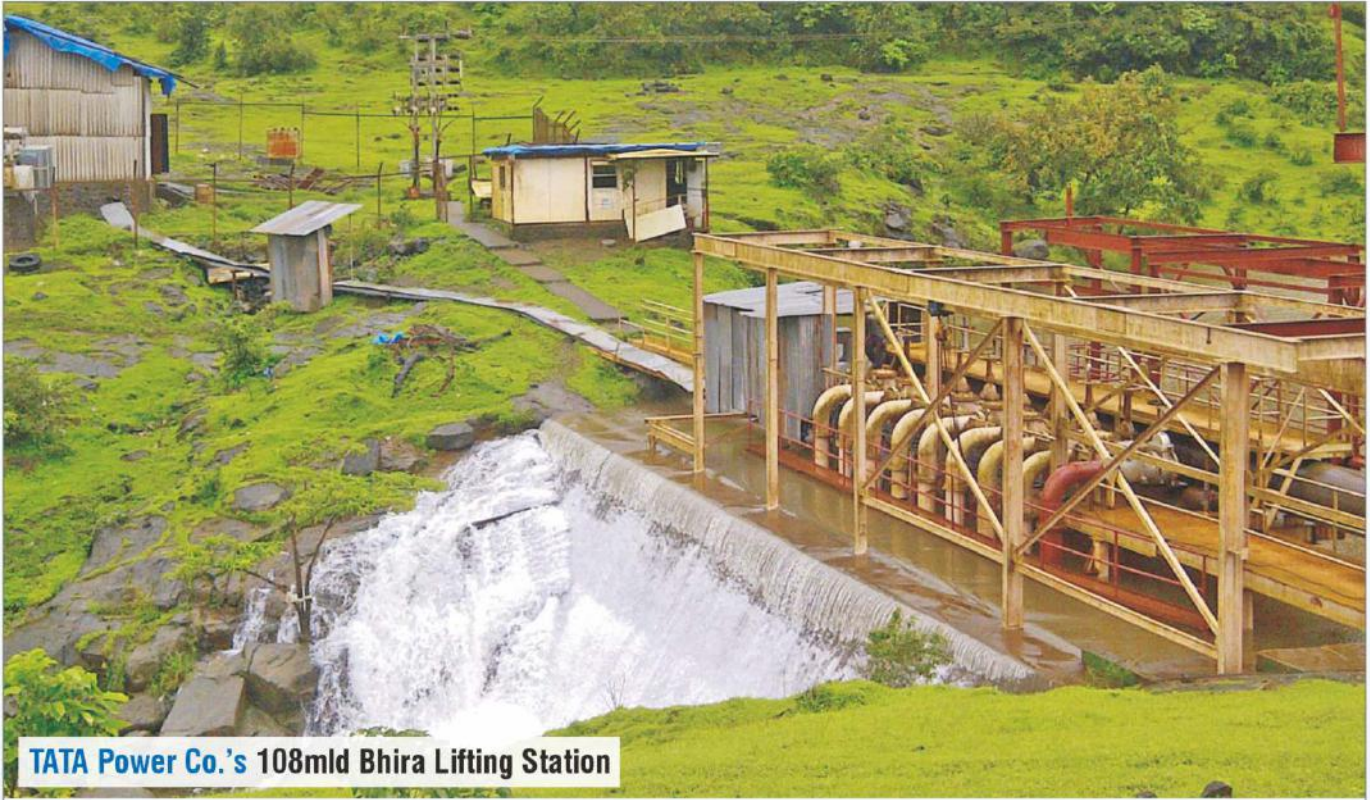
- 1) **Rise &/or Fall of Water Levels**

&/or

- 2) **Shifting &/or Meandering of Water Course**



## Some References



**TATA Power Co.'s 108mld Bhira Lifting Station**



**Ahmedabad 864mld Intake** (each SCF of 4500m<sup>3</sup>/hr)



**GIDC Saykha WDS**  
(Total installed Motor Rating 1000hp)

## Some References



**Gujarat Water Grid**  
**55mld Machhu Dam**  
 Submerged Pumpset **Floating**  
**Pontoon** Pumping Station



**Gujarat Water Grid**  
**300mld Sadulka**  
**DBC Offtake**  
*(SCF Pumpsets*  
*Installed Vertically on*  
*Auto-Coupling)*



**Ahmedabad Smruti Mandir WDS**  
*(SCF Pumpsets Installed Vertically*  
*on Auto-Coupling)*



**Gujarat Water Grid NC4A** Raw Water Transmission  
 Pumping Station (*600hp x 10 Nos. SCF*)



**Ahmedabad Nikol Lilanagar WDS** 1800m<sup>3</sup>/hr  
 SCF Pumpsets for water distribution directly from UGR



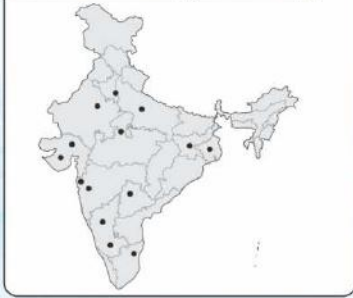
**Ahmedabad Jaspur WTP** 500mm nozzle SCF used  
 to deliver **150mld** directly from canal



*Aqua has been awarded the Prestigious Best Quality Pump Vendor by*



**A Pan India Support set up**



**Some of Our Other Products**



**Submerged Turbine Pumpsets (AVT)**



**Submerged Tubular Column Pumpsets (ATB)**



**Dry Pit Installed Submerged Centrifugal Flood Proof Pumpsets (ARFP)**



**Non Clog Submersible Sewage Pumpsets (ANS)**



**Pontoons & Walkways**



**Submerged Elbow Pumpsets (AES)**



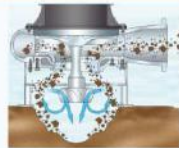
**Submerged Mine Dewatering Pumpsets (AMS)**



**Submersible Slurry Hydro Electric Pumpsets (ASSHE)**



**Submersible Slurry Pumpsets (ASS)**



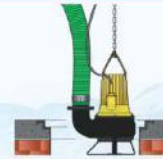
**Submersible Dredging Pumpsets (ADS)**



**Dry Pit Installed Non Clog Flood Proof Submersible Pumpsets (ANFP)**



**Ultra Compact Submersible Sewage Pumpsets (Scavenger)**



**Submersible Sewer Manhole Pumpsets (AM)**

**Spacious & State of the Art Plant...**

**Centralized Quotation Cell :**  
marketing@aquapumps.com  
(+91-80001 53324)

**After Sales & Services :**  
service@aquapumps.com  
(+91-90167 53328)  
(+91-98259 51116)

**Feedback :**  
ajp@aquapumps.com



# Aqua Machineries Private Limited

[www.aquapumps.com](http://www.aquapumps.com)

**Registered Office & Manufacturing Plant**

Survey No. 504/1-2, 442/2, Near Haridarshan Estate, Near Express Highway, Ramol, Ahmedabad-382 445. Gujarat, India.