

***A 297mld Booster Pumping Station (utilizing Existing RWR Sump)  
commissioned within a month,  
at just 30%<sup>#</sup> & 50%<sup>#</sup> of Capital Cost & Life Cycle Cost (respectively)  
<sup>#</sup>as compared to competing pumpset technologies.***



Gujarat constantly faces severe water scarcity. About 70% of the state's freshwater resources are located within 30% of its geographical area while major regions such as Saurashtra and Kutch remain arid and

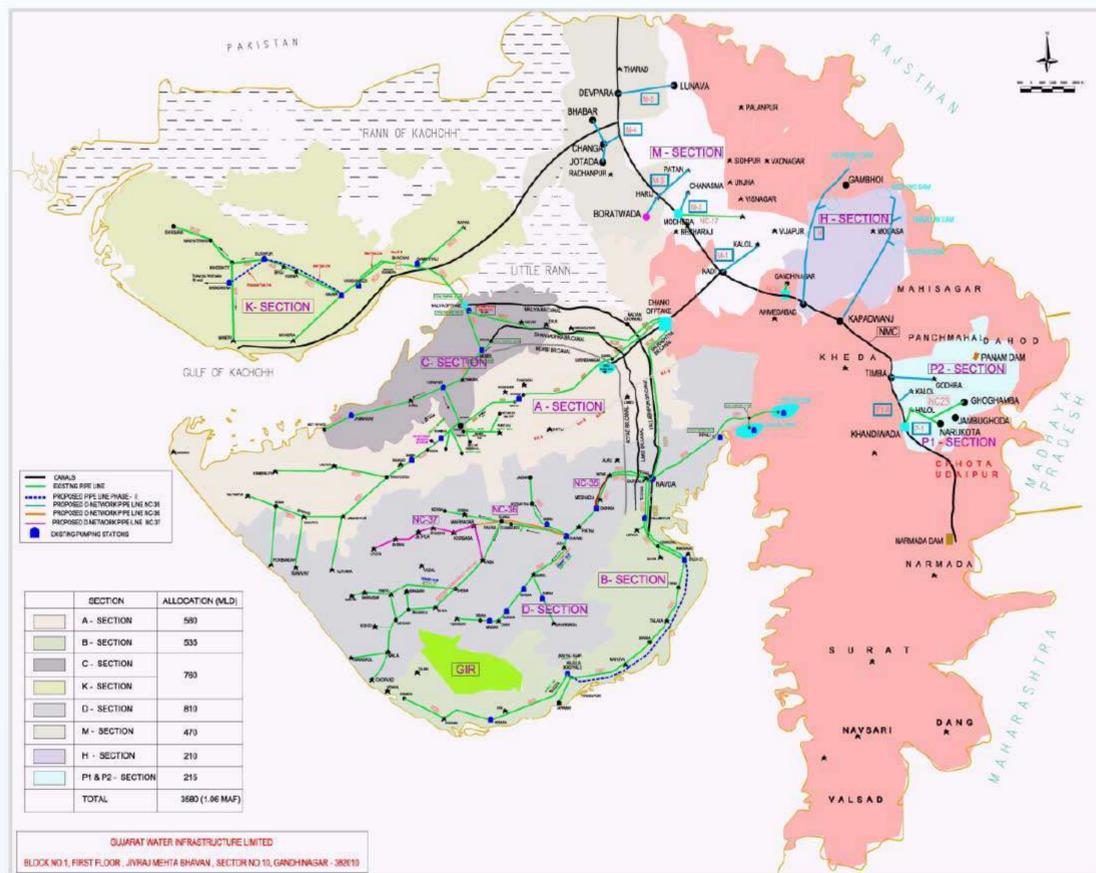


receive insufficient rainfall, facing the brunt of frequent droughts.



## Situation

During **Monsoon-2015**, there was **inadequate rainfall** in Rajkot, Jamnagar, Dev Bhoomi Dwarka and Porbandar districts serious scarcity of drinking water in Rajkot, Jamnagar, Dev Bhoomi Dwarka and Porbandar Districts. Various **dams** like Khambhala, Fodara, Vartu-2, Sani, Ghee, Sinhan etc. were almost **empty**.



From Dhanki Pumping Station **Narmada water** flows in NC-32 to NC-33 to NC-34 to NC-20 Hadala to Khambhala, Sanala, Panchdevda & onwards.

Four districts Rajkot, Jamnagar, Dwarka & Porbandar are beneficiary of the Narmada Pipe Line.

*“The capacity of (Hadala to Khambhala pipeline + Pumping Station) was limited to 190 MLD but water requirement was more than 300MLD..!”*

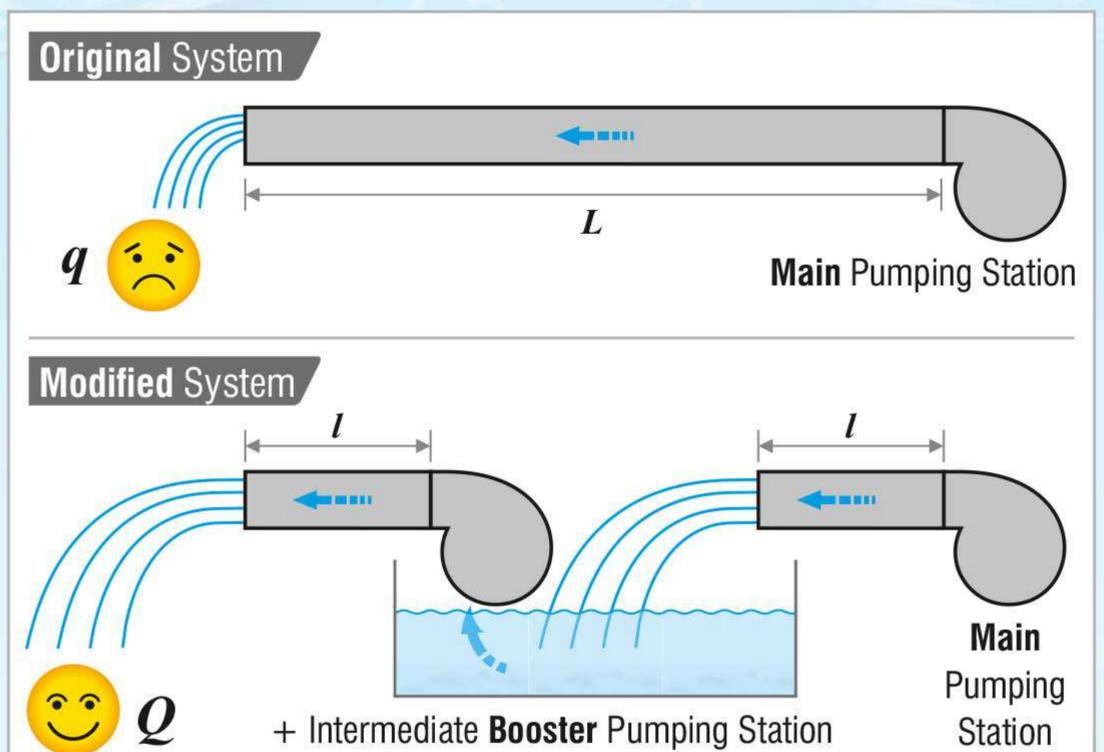
Incumbent C.E., **Shri N M Patel**

## Solution

In a bid to mitigate the problem of water scarcity, at the Existing Hadala Sump; Engineers devised an innovative idea of utilizing existing Kankot - Hadala - Naranka -Khambhala  $\varnothing$  1850mm diameter pipeline (carrying presently approx. 190mld of Narmada water) to enhance it to 300mld **by establishing an Intermediate Booster Pumping Station using existing HGL RWR Sump.**

It was decided to allow Narmada Water to **Free Fall** into Hadala HGL Sump (by closing butterfly valve already installed on rising main Kankot-Hadala-Naranka-Khambhala) due to which the **Frictional Losses** of downstream pipeline (Hadala - Naranka - Khambhala section) **would be eliminated** thereby reducing head on pumps of NC34 Kankot PS allowing them to **push more water** in same size of pipeline.

A New Intermediate Booster PS using existing Hadala Sump (& laying 1200mm diameter rising main to inter connect existing same rising main beyond Butterfly Valve) would then pushed the increased water quantity being received.



## Quandry...?

Now came the decision part - GWSSB's Engineers had a puzzling of choice using either Conventional Pumpset or SubCF based Pumping Station.



**Conventional Pumping Technology**  
Pump based Station



$$\text{Benefit-Cost Ratio} = \frac{\sum_{t=0}^n \frac{CF_t [\text{Benefits}]}{(1+i)^t}}{\sum_{t=0}^n \frac{CF_t [\text{Costs}]}{(1+i)^t}}$$



**SubCF Pump based**  
Station

Unlike Conventional Pumping Technology pumpsets, **SubCF pumps could utilize the existing Sump** as an Intermediate Booster Pumping Station; could be set up & commissioned in just approx 30% Capital Cost & 50% Life Cycle Cost savings (as compared to Conventional Pumping Technology). After careful considerations, cost comparison & benefits between the above two options; Engineers decided to go for SubCF based Intermediate Booster PS.

*“Due to Very Low CAPEX (especially the Cost of Civil Structures) & Low OPEX (Maintenance) required by SubCF Pumps, it's Life Cycle Cost (LCC) & Benefit - Cost ratio were favorable.”*

## Execution

Aqua **started work on 03rd May 2016** and deployed multiple teams for different work like mechanical welding work, civil excavation/RCC work and electrical work as well as a team to provide necessary materials from Ahmedabad to Hadala station for the project. The welding work was going continuously as well as laying of Ø 1200mm pipe line with excavation, Ø 400mm delivery pipe manifold, connections of cables, erection of control panel boards etc.

Aqua also provided an extra team to increase electrical Load from 2200KVA to 4000 KVA and within 02 days the electrical load extended by M/s. PGVCL.



<b>Customer :</b>	 Gujarat Water Supply & Sewerage Board
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<b>Pump Model</b>
ARS._H_PS_1st_VoG_2542_M._M._0250_00415_NJ.

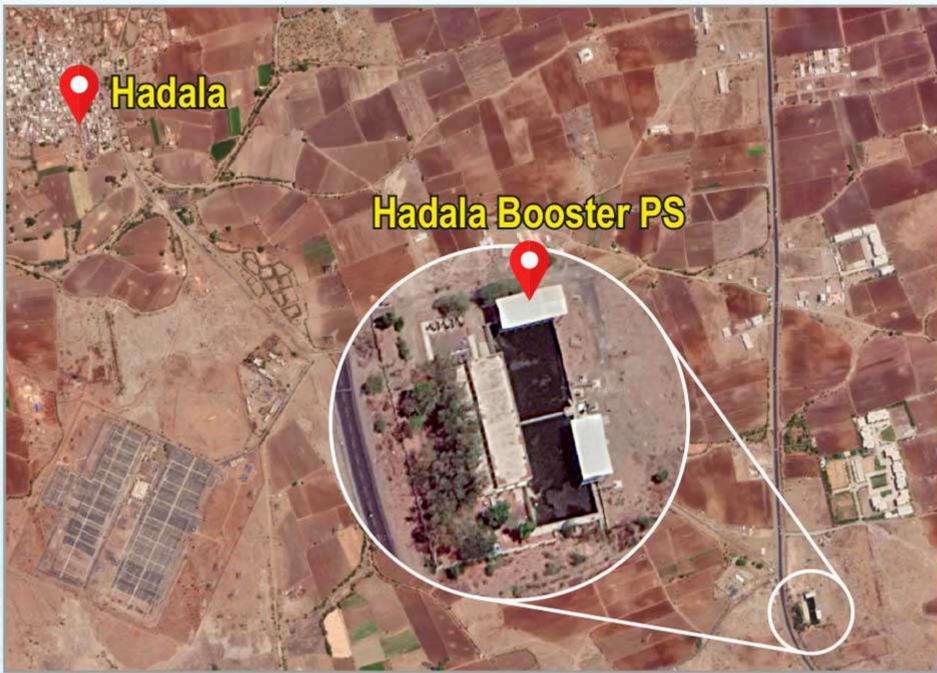
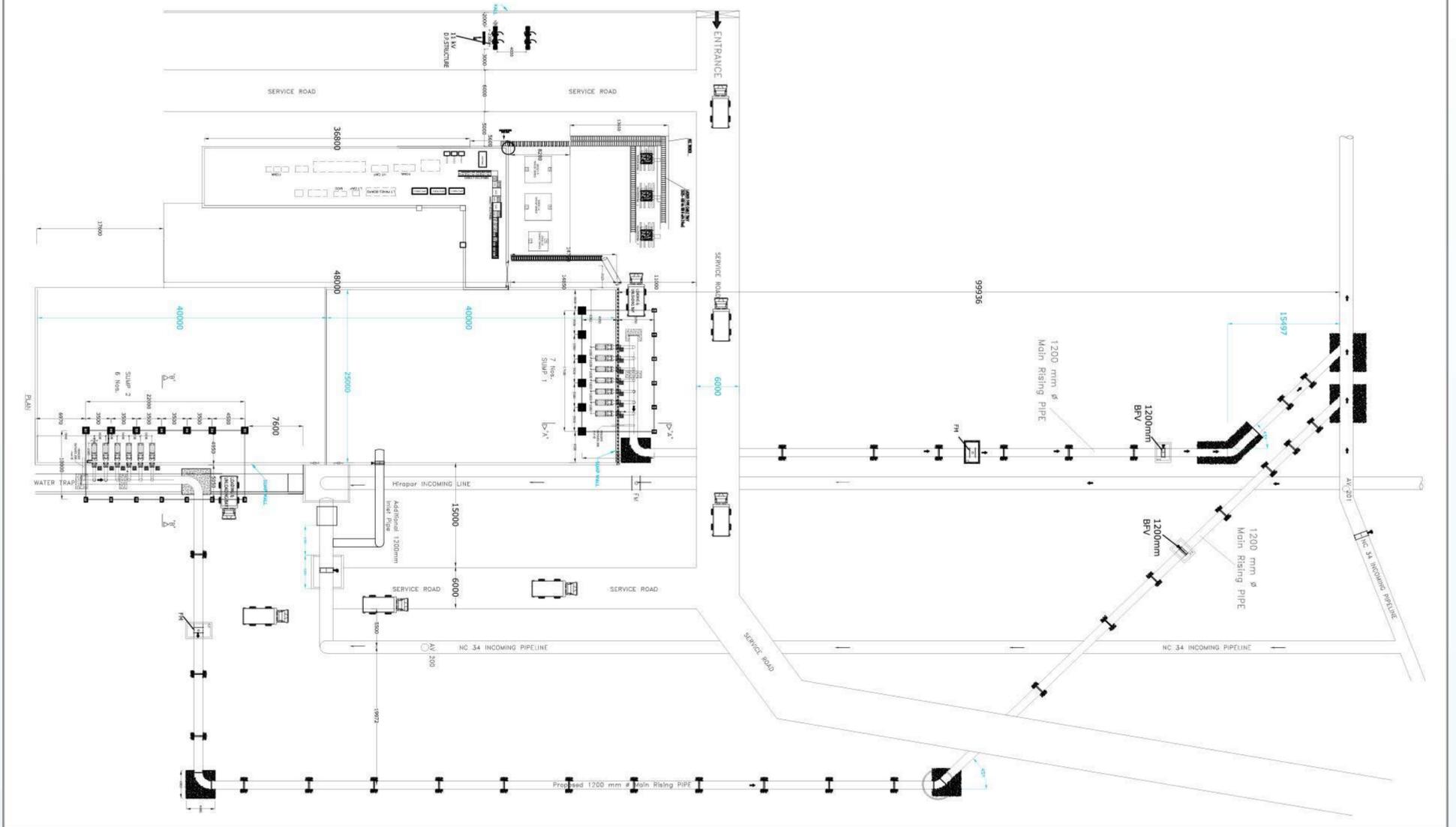
Flow	Head	kW/hp	Qty.
<b>1240 m<sup>3</sup>/hr</b>	<b>39 m</b>	<b>186 / 250</b>	<b>13 Nos.</b> (10W+3S)

<b>Installation</b>
at HADALA Head Works, towards NC20 Project



The existing Electrical Room was used to house Additional Switchgears.

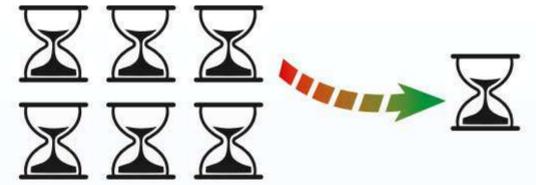
**GA Drawing:**



**MS Hoisting Structure (with Pre-Cast RCC Foundation Blocks) with EoT allow simple & quick pump installation - removal.**



**SubCF Pumps being Installed**



Work was awarded on **3rd May** & eagerly Inaugurated on **20th May** by :

- Hon. **Minister Water Supply** (*Shri Vijay Rupani*),
- Hon. **Rajkot Municipal Commisioner** (*IAS Shri Vijay Nehra*),
- Hon. **Member Secretary Water Supply** (*IFS Shri Mahesh Singh*),
- **CE GWSSB** (*Shri N M Patel*) & many dignitaries

(& formal O&M started on 6th June)



## Benefits of Aqua's SubCF pumps :

Aqua's SubCF pumps enable very **Low CAPEX** (especially the Cost of Civil Structures) & **Low OPEX** (Maintenance & Energy) making it's **Life Cycle Cost (LCC)** & **Benefit - Cost ratio** very favorable.



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



### Mechanical Seals

Two, Independent; Seals rated for at least **16 / 25 bar** pressure capability for **L<sub>10H</sub>** life in excess of **50,000 hours** &/or **5 years**.



## Long Life, Maintenance Free



### Bearings

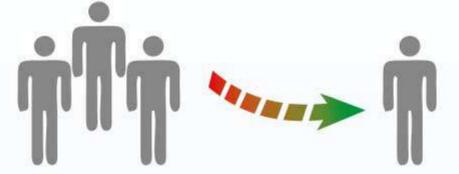
**Heavy duty**, Anti Friction, bearings are designed for **L<sub>10H</sub>** life in excess of **1,00,000 hours** &/or **10 years**.

## Ultra Low ManPower Requirement

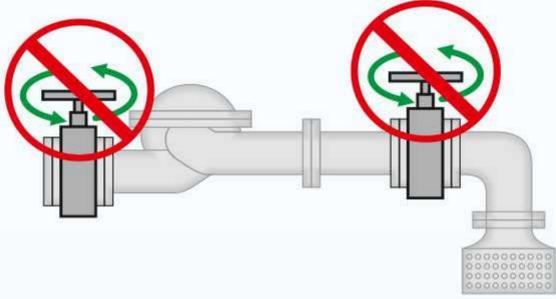


**Requires No Special Pre – Post / Ancillary-Auxillary Operations;** like :

- Suction Priming during Pump StartUp,
- Operating the Dewatering Pump to water leakage from Seepage / Gland Piping Leakage, etc.



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



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



**...Aligning / Replacing**

**Shafts/Sleeves &/or Coupling**

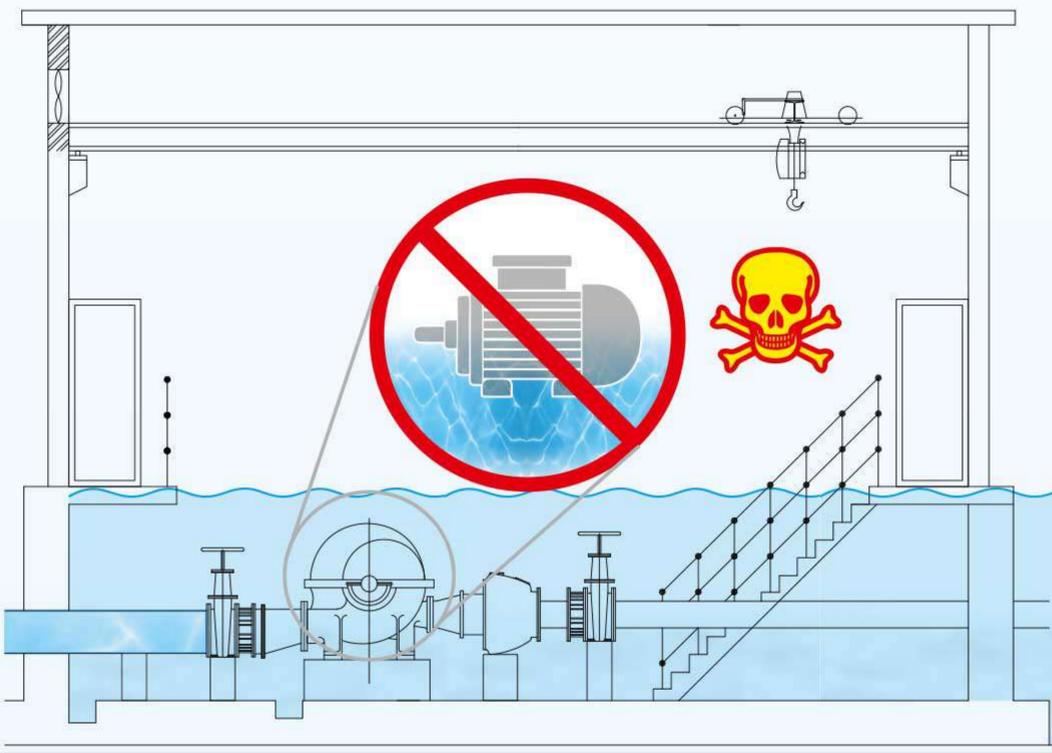
**No need for Frequent Periodic....**

**...Adjusting / Replacing**

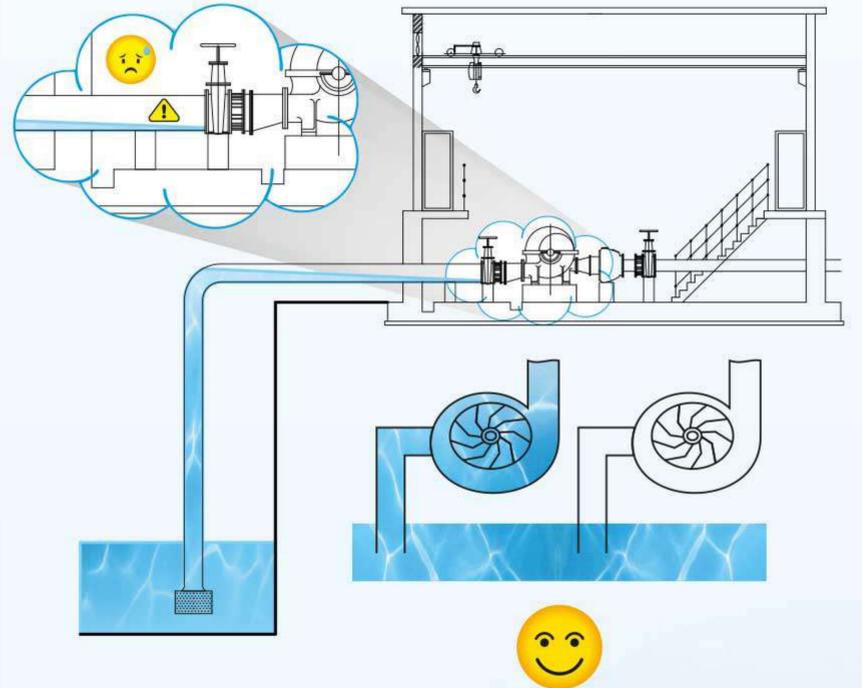
**Gland Packing**

**...Refilling**

**Oil &/or Grease**



**No Risk of Motor Burnout** under Water Accumulated from Leakage of Piping &/or pump's Gland &/or pump's Gasket &/or Seepage from Wall (even after Lack of Frequent DeWatering) due to **Operator's Absenteeism** &/or Failure of DeWatering System.



**No need of Suction Priming**

Air Cooled Motor - Pumpsets require Costly & Spacious Pump Rooms



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



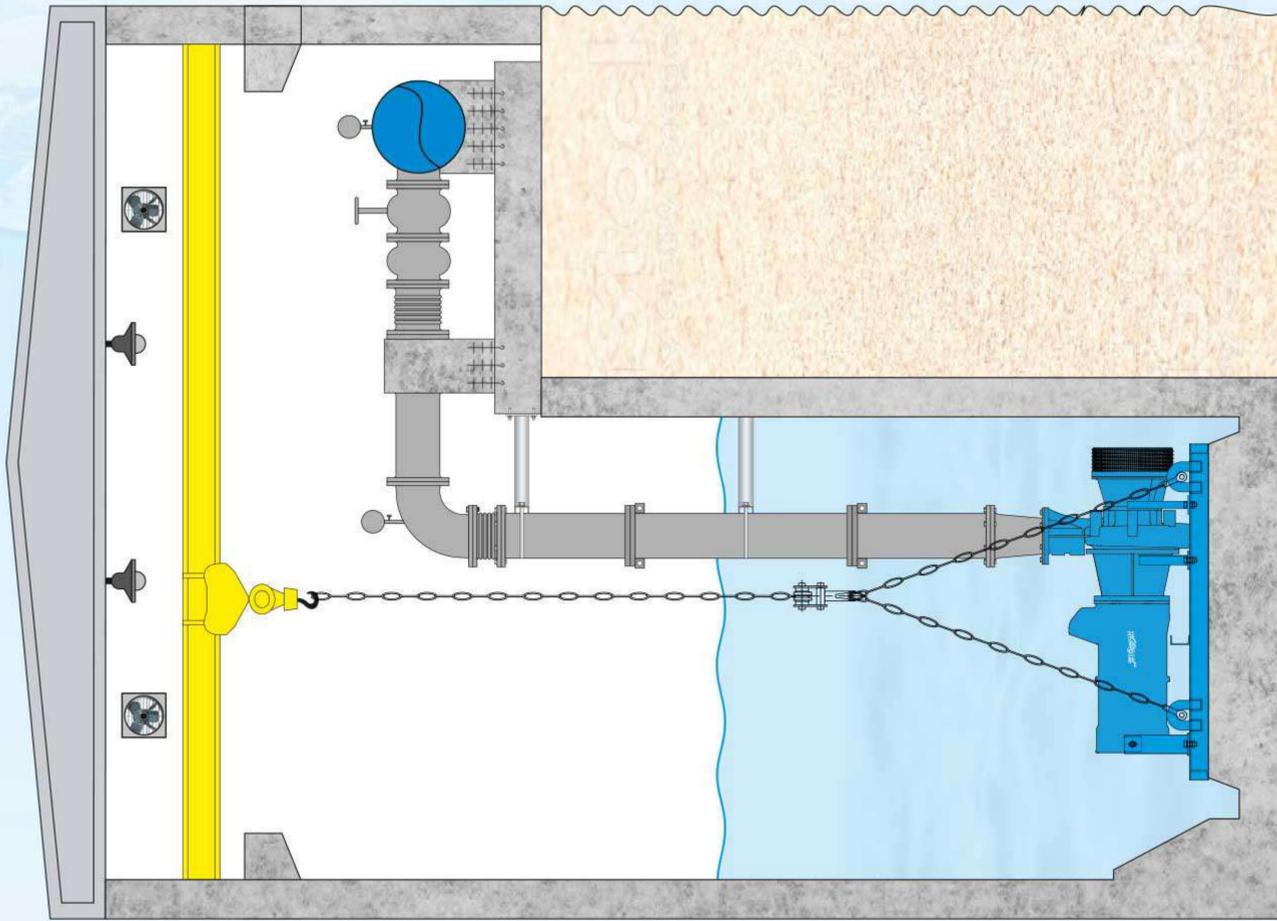
**Saves (upto 45%) Capital Cost of Entire Pumping Stations\***

SubCF pumpsets can be immersed directly in to Wet Pit (Clear Water Sump); hence **Eliminating** the need of Dry Pit (Pump room) resulting in **Huge Land Saving**.



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

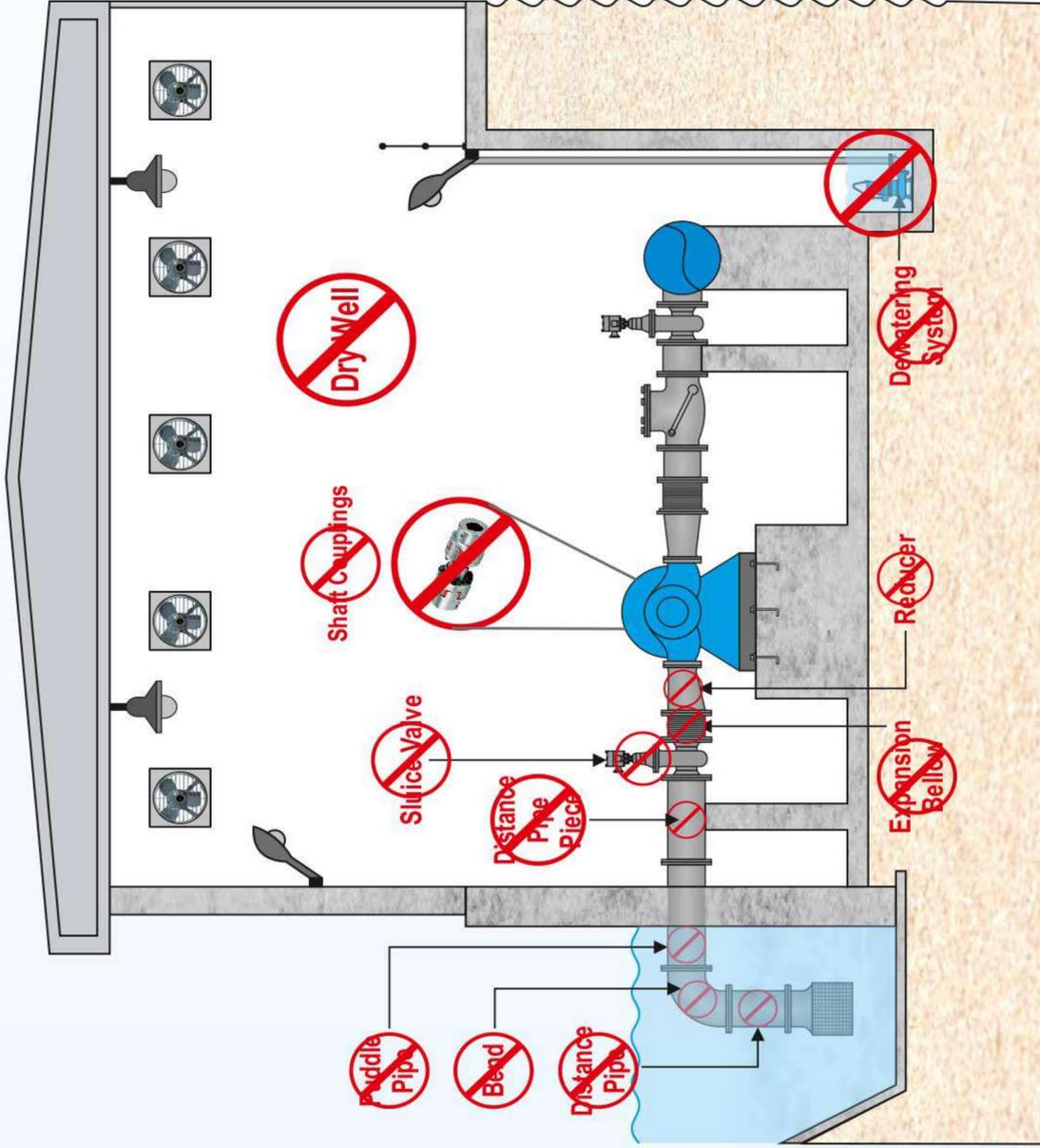
# Zero Ancillary &/or Auxiliary Systems & Fewer Parts Lead to a Huge Reduction in Requirement of O&M ManPower & Spare Parts



### Recommended Types of Spare Parts

to be kept in PumpHouse for 2year operation (as per DIN 24296)

1	Impeller	6	Casing wear ring
2	Rolling Element / Angular contact ball bearing	7	Impeller wear ring
3	Rolling Element / Deep Groove ball bearing	8	Cable Gland
4	O-ring	<b>9</b>	Motor (Rotor, Stator)
5	Mechanical seal (set)		



### Recommended Types of Spare Parts

to be kept in PumpHouse for 2year operation (as per DIN 24296)

1	Impeller	10	Impeller wear ring	19	Grooved pin
2	Rolling Element / Angular contact ball bearing	11	Shaft protecting sleeve	20	Fastening elements for the shaft
3	Rolling Element / Deep Groove ball bearing	12	Bearing sleeve	21	Stuffing Box insert
4	Gasket	13	Bush (thrust and radial bearing)	22	Gland follower
5	Joint ring	14	Locking sleeve, complete	23	Neck ring
6	O-ring	15	Threaded bush	24	Lantern ring
7	Mechanical seal (set)	16	Bearing bush	25	Spacer sleeve
8	Gland packing (set)	17	Torque transmitting coupling elements	26	Seal cover
9	Casing wear ring	18	Lock washer	27	Motor (Entire Unit)
				<b>27</b>	

**SubCF pumpsets require just 9 types of Spare Parts as compared to 27 types for Conventional pumpsets.....!**





### Gujarat Water Supply & Sewerage Board

(A Government of Gujarat undertaking)  
O/ O THE EXECUTIVE ENGINEER, P. H. MECHANICAL DIVISION,  
"JALBHAVAN", SARU SECTION ROAD, NR. MILK DAIRY, JAMNAGAR.  
PHONE- (0288) 2551893 e-mail:- eemdnjmr@gmail.com

No. PB/Hadala/Pump/Performance/ 442/

DI. 06.04.2022



Water Supply

#### TO WHOMSOEVER IT MAY CONCERN

These pumps are manufactured, supplied, erected and commissioned by M/s Aqua Machineries Pvt. Ltd. for Emergency work of SITC of SCF Pump Sets at Hadala head works with Mechanical and Electrical Equipments & Accessories etc. Complete including comprehensive O & M for 5 years for NC 20 project

Pump set Type : Submerged Centrifugal Pumpset with Integral motor.

Pump set Make : Aqua Machineries Pvt. Ltd, Ahmedabad.

Application : Raw Water Handling

Pump Model : ARS\_H\_PS\_1st\_VoG\_2542\_M.M.\_0250\_00415\_NJ.

Head : 39 Mtr

Discharge : 1240 M3/hr

No of Stages : One

DN Size : 250 MM

Motor Rating : 250 HP / 186 KW

Voltage Level : 415 V

Motor Type : LT Submerged Squirrel Cage Induction - Dry Air filled Totally Enclosed (IP 68) Self Frame Surface Water Cooled (TESWC) complying to IC4A1W0 of IS 6362

Qty : 13Nos (10W+3S)

Installation : @ HADALA HEAD WORKS TOWARDS NC 20 PROJECT

These pumps were commissioned in the month of 6<sup>th</sup> June 2016 and are working satisfactorily till date.

*M. Patel*  
Executive Engineer,  
P. H. Mechanical Division,  
Jamnagar.

FORM NO. 3(A)  
(Referred to in Rule No. 5 B (ii))

#### WORK WISE DETAILS OF WORK COMPLETED OR PROGRESS BY THE CONTRACTOR

1	Name of Contractor	Aqua Machineries Pvt. Ltd. Plot No. 3821, Phase-IV, G.I.D.C. Vatva, Ahmadabad
2	LoI / Work Order No. & Date	LoI No.: TVWS / Hadala Emergency / SITC / LoA / 1265, Dated 03.05.2016 WO No.: AB/HADALA/WO/969, dated 10.05.2016
3	Name of Work	Emergency work of SITC of SCF Pump Sets at Hadala head works with Mechanical and Electrical Equipments & Accessories etc. complete including comprehensive O & M for 5 years for NC 20 project
4	Estimated Cost of Work put to Tender	Rs. 96747370.00
5	Tender Amount	Rs. 101584738.00 (SITC + O&M)
6	Date of Starting the Work	03.05.2016
7	Stipulated Date of Completion of Work	01.06.2016
8	Actual Date of Completion of work	06.06.2016
9	Amount of Work done up to Date	Rs. 86588727/- (SITC only) + Rs 508908/- (O&M) = Total Rs. 87097635/-

*M. Patel*  
Signature of the Contractor

10	State whether the details as above given by the contractor are correct, if not state as to what is correct information	Yes
11	State whether the contractor has Executed the work in progress satisfactorily as per specifications. If not give the correct position of the work.	SITC works of the project were completed on 06.06.2016. Operation & Maintenance work is under progress since 06.06.2016.
12	Any other Remarks	Above works consisting one of the followings; 1. 186.50 kW (250 HP) X 13 (10+3) Nos. (SCF Pump sets) = Total kW 2424.50 2. 2000 KVA Transformer - 3 Nos. 3. 11kv HI VCB Panel - 1 No. 4. 1219 mm MS Pipe - 400 Mtr

No/AB/ 831 26/4/17  
Place: Jamnagar  
Date: 26/04/2017

*M. Patel*  
Executive Engineer  
P. H. Mechanical Division  
GWSSB, Jamnagar

“As we were facing severe water scarcity, we had to execute a Booster PS (BPS) in a very short time & as a Non Budgeted item - hence after due diligence of Benefit Cost Ratio (BCR); we went in for SubCF based BPS. We are very satisfied with the Sincere Execution done by m/s Aqua & with the overall smooth performance of the SubCF pumps there after.”

Incumbent C.E., Shri N M Patel

## 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.

[marketing@aquapumps.com](mailto:marketing@aquapumps.com)