



Enriching Lives

## KIRLOSKAR BROTHERS LIMITED

A Kirloskar Group Company

### GLOBAL HEADQUARTERS

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### GLOBAL PRESENCE

Cambodia | Egypt | India | Lao PDR | Senegal | South Africa | Thailand | The Netherlands  
| United Arab Emirates | United Kingdom | United States of America | Vietnam

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

### OUR COMPANIES



United Kingdom



U.S.A.



South Africa



India



The Netherlands



Enriching Lives

# Concrete Volute Pumps



## KIRLOSKAR BROTHERS LIMITED

A Kirloskar Group Company  
Established 1888

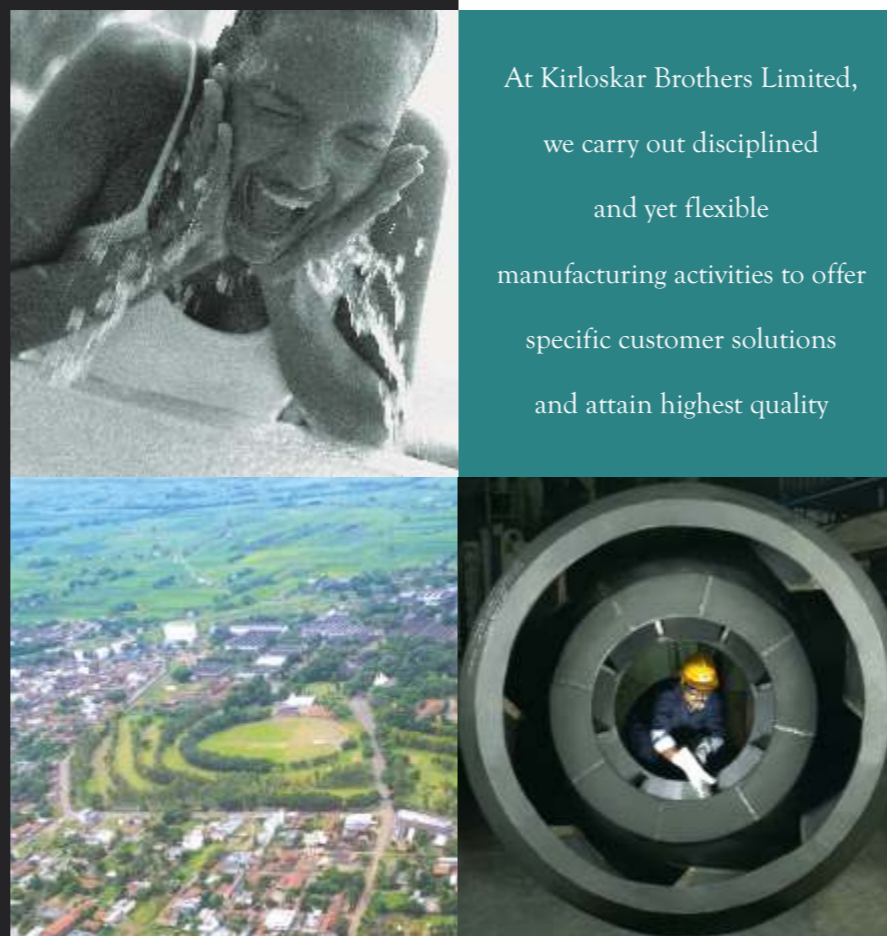


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## We are the Kirloskar Group of Companies

At Kirloskar, listening to the customer and his needs is a tradition as old as the group itself. For it is they who drive us further, make us reach higher, and engineer better solutions. In the customer's often unspoken wish for better implements lies the seed for new inventions, and path-breaking industrial concept. Business for us is the best service, customer care and a lifelong relationship.

Our pumps have wide ranging applications from gardening and domestic water supply to irrigation, large water supply schemes, process industries, aqua-culture, air conditioning, sewage, power stations, fire fighting, process industries - refineries, fertilisers, sugar, petro-chemicals, chemicals, domestic, utilities and many more.



At Kirloskar Brothers Limited,  
we carry out disciplined  
and yet flexible  
manufacturing activities to offer  
specific customer solutions  
and attain highest quality

Kirloskar Brothers Limited (KBL) is a world class pump manufacturing company with expertise in engineering and manufacture of systems for fluid management. Established in 1888 and incorporated in 1920, KBL is the flagship company of the \$ 2.1 billion Kirloskar Group. KBL, a market leader, provides complete fluid management solutions for large infrastructure projects in the areas of water supply, power plants, irrigation, oil & gas and marine & defence. We engineer and manufacture industrial, agriculture and domestic pumps, valves and hydro turbines.

In 2003, KBL acquired SPP Pumps, United Kingdom and established SPP INC, Atlanta, USA, as a wholly owned subsidiary of SPP, UK to expand its international presence. In 2007, Kirloskar Brothers International B.V., The Netherlands and Kirloskar Brothers (Thailand) Ltd., a wholly owned subsidiary in Thailand, were incorporated. In 2008, KBL incorporated Kirloskar Brothers Europe B.V. (Kirloskar Pompen B.V. since June 2014), a joint venture between Kirloskar International B.V. and Industrial Pump Group, The Netherlands. In 2010, KBL further consolidated its global position by acquiring Braybar Pumps, South Africa. SPP MENA was established in Egypt in 2012. In 2014, KBL acquired SyncroFlo Inc., the largest independent fabricator of commercial and municipal domestic water booster pumps.

To further strengthen its global position, in 2015, Kirloskar Pompen B.V. acquired Rodelta Pumps International, The Netherlands.

KBL has joint venture cooperation with Ebara, Japan since 1988 for the manufacture of API 610 standard pumps. Kirloskar Corrocoat Private Limited is a joint venture cooperation with Corrocoat, UK since 2006. KBL acquired The Kolhapur Steel Limited in 2007 and Hematic Motors in 2010.

KBL has eight manufacturing facilities in India at Kirloskarvadi, Dewas, Kondhapuri, Shirwal, Sanand, Kaniyur, Kolhapur and Karad. In addition, KBL has global manufacturing and packaging facilities in Egypt, South Africa, Thailand, The Netherlands, United Arab Emirates, United Kingdom and United States of America. KBL has 12,700 channel partners in India and 80 overseas and is supported by best-in-class network of Authorised Centres and Authorised Refurbishment Centres across the country.

All the manufacturing facilities at KBL are certified for ISO 9001, ISO 14001, ISO 50001, BS OHSAS 18001 and SA8000. In addition, the Kirloskarvadi plant is also certified for N & NPT Stamp. KBL's corporate office in Pune is certified for ISO 9001 & SA8000.

The factories deploy Total Quality Management tools using European Foundation for Quality Management (EFQM) model. The Kirloskarvadi plant of KBL is a state-of-the-art integrated manufacturing facility having Asia's largest hydraulic research centre with testing facility up to 5000 kW and 50,000 m<sup>3</sup>/hr.

KBL is the ninth pump manufacturing company in the world to be accredited with the N and NPT certification by American Society of Mechanical Engineers (ASME).

## History of Concrete Volute Pump

The first Concrete Volute Pump was installed almost 90 years ago for raising sea water in the harbour basin. Till today, this pump is in an excellent working condition.

The concept of Concrete Volute evolved due to scarcity of steel during first world war.

Originally developed to provide a solution to the problem associated with reclamation of vast areas, where huge water is to be lifted by few meters.

## Concrete Volute Technology

Concrete Volute Pump is a technique widely used in several countries like Germany, UK, Italy, The Netherlands, Portugal, Soviet Union, to name a few apart from India.

In addition to being India's largest pump manufacturer, exporter and turnkey contractor of pumping machinery, Kirloskar Brothers Limited (KBL) is an undisputed leader and pioneer in the field of fluid handling in India. KBL has been able to achieve this success for more than 100 years because of its pioneering spirit. As a result, KBL has many firsts in India to its credit, such as the first End Suction Pump, the first Canned Motor Pump, the first Sodium Pump for fast breeder reactor and also - **The Concrete Volute Pump (CVP)**

In today's applications, pumps are expected to run continuously for prolonged times. Thus, "Operational Reliability" is a crucial factor. As the size of the pump increases, the dimension and weights of the heaviest parts have a large influence on the choice of construction material used. Concrete is therefore, the natural choice for the pump body.

The Concrete Volute Pump was hence, a revolutionary development in the pump industry. As the casing is constructed in concrete at site, CVP is the most suitable pumping option from techno-economic consideration for handling large volumes of water. Concrete Volute Pump guarantees strength and rigidity and virtually eliminates the problems of corrosion and erosion. It also ensures higher & consistent pump efficiencies over a sustained period of operation. Due to simplicity of construction and ease of maintenance; the reliability achieved is of the order of 99.95%.



## Concrete Volute Pump Constructional Features

These pumps are called Concrete Volute Pumps because the Casing and Suction Draft Tube is cast in-situ Concrete. The rotating parts are metallic. The simple mechanical design is the major advantage of a Concrete Volute Pump.

Concrete Volute Pump Construction can be grouped into three major sections as follows:

Concrete Volute Casing and Draft Tube

Grouted Embedded Components

Rotating Assembly

## Applications

Concrete Volute Pumps are working mainly for applications where large quantity of flow is required to be handled, and most suitable for Sea Water application.

Circulating / Condenser Cooling Water for Power Plants

Lift Irrigation

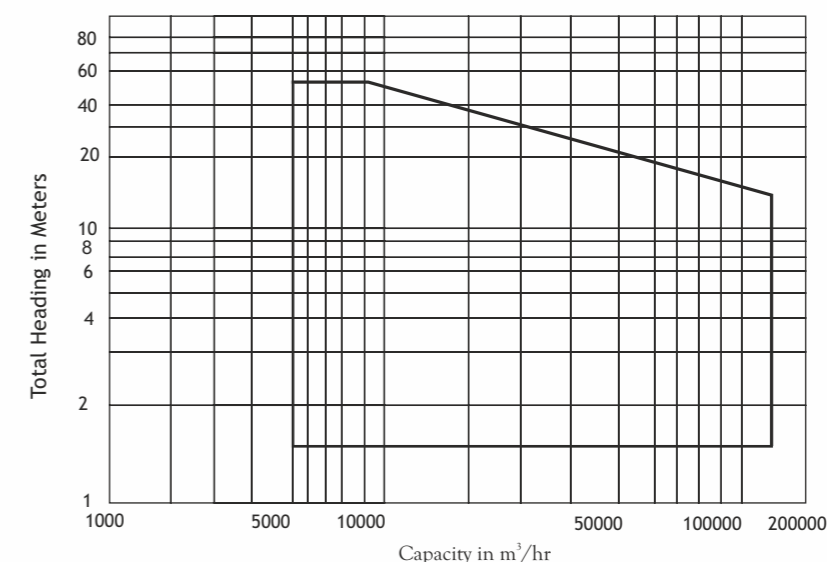
Water Supply

Drainage and Flood Control

Dry Docks

Desalination

## Operating Range



Range  
Delivery size  
upto 6000 mm, (236")  
Capacity  
upto 120,000 m³/hr,  
(528,360 US GPM)  
Head  
upto 50 m (164ft)

*Note : Higher Heads possible with special design.*

## Why Kirloskar Concrete Volute Pumps prove to be a better choice?

High Reliability

Design Simplicity

Superior Operating Performance

Vibration Free Equipment

Lowest Maintenance Costs

Excellent Corrosion Resistance

Other Technical Advantages



### High Reliability

High Reliability upto 99.95% that eliminates stand by pumps.

The French Electricity Board installed a single pump for 700MW Thermal Power Plant and two 50% pumps for 900MW and 1300MW Nuclear Power Plants.

Stand - by pumps are not required.

### Design Simplicity

Seven main parts only, each one specifically engineered for any of the particular pumping system.

Simple removable wooden formworks and standard quality concrete without special surface finishing are sufficient.

### Superior Operating Performance

For given parameters CV Pumps offer 1-2% higher efficiency compared to Metallic Vertical Pumps due to hydraulic design.

Lowest Life-cycle cost.

## Vibration Free Equipment

- Low Rotating speed
- Impeller Dynamically balanced
- Mass casing in concrete provides excellent inertia
- Antiseismic construction

## Lowest Maintenance Cost

- Simple preventive maintenance on yearly schedule
- Recommended inspection after every 40,000 hours only
- Many pumps are running upto 70,000 hours without major component replacement
- Main pump parts can be checked is-situ and without pump dewatering

## Excellent Corrosion Resistance

- Few moving and metallic parts in contact with water
- Perfect Hydraulic design of Draft Tube and Volute eliminates Vortices and risks of concrete deterioration

## Other Technical Advantages

- Low submergence required.
- Lower Crane height & lifting capacity requirement.
- Full accessibility
  - Easy internal inspection without dismantling
  - Impeller can be examined from suction elbow
  - Rotor from manhole

Simple to construct Volute and Draft tube, can be carried out by Civil Construction Company at site.



## Concrete Volute Pump an Economical Concept

Investments Costs	Overall expenditures for the complete pumping system are substantially lower than other solutions
Transportation & Installation Costs	No pump casing therefore total weight of removable components is a small fraction of that of conventional units
Operating Costs	No anchoring necessary Excellent efficiency and reliability Low Maintenance equipment and less manpower required Fewer spare parts to be kept handy

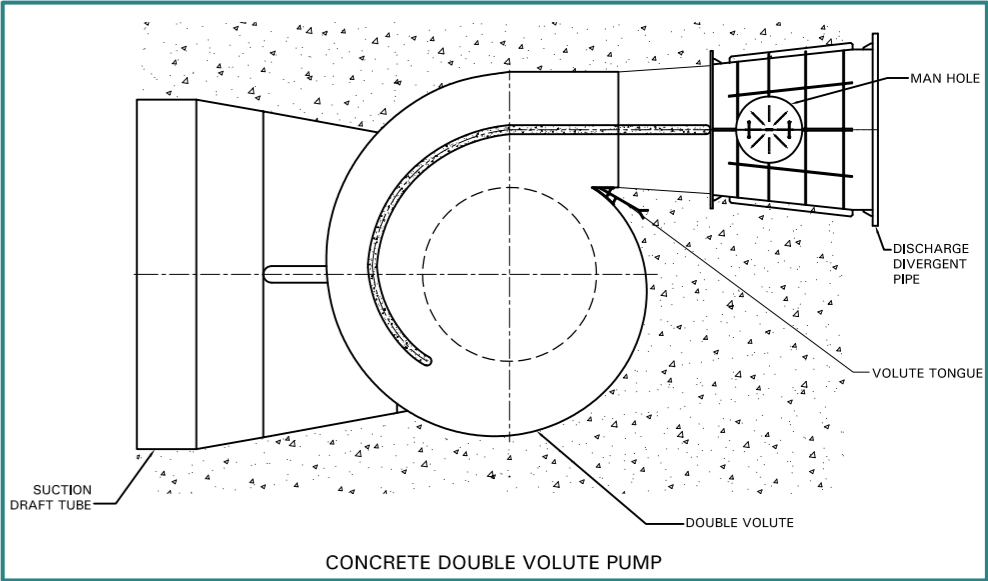
Stages of Construction of Concrete Volute Pump



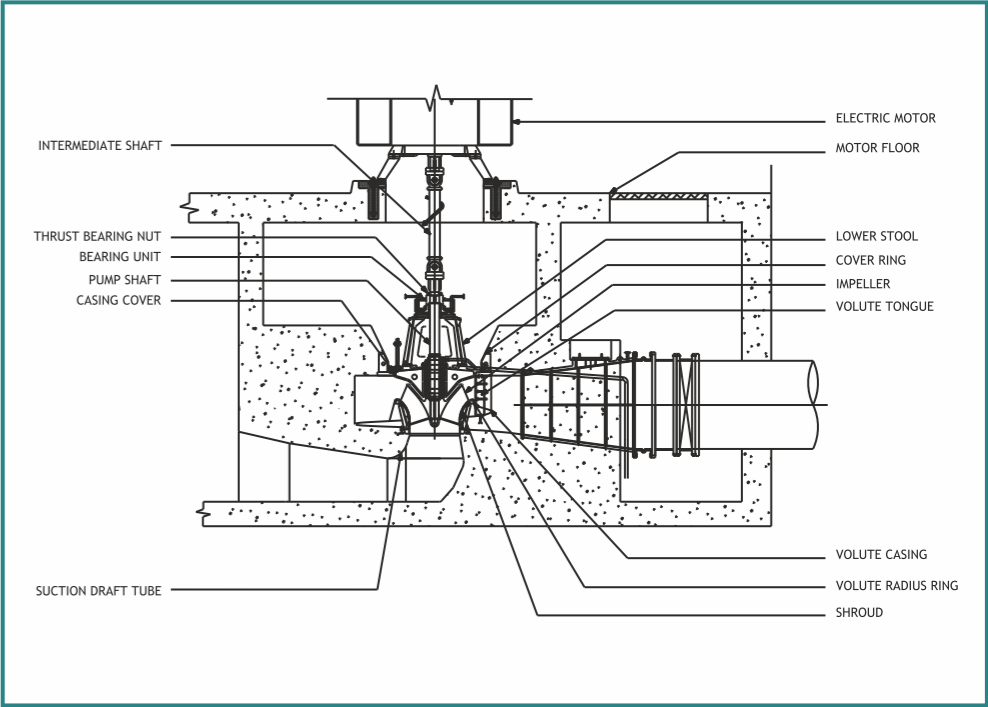
The construction of typical Concrete Volute Pump proceeds in the following stages:

- |  |  |
|--|--|
| 1. Placement of Wooden formwork for Suction Draft Tube                       | 6. Placement of Shroud                                       |
| 2. Placement of Shroud Holder Ring   | 7. Lowering the Impeller                                     |
| 3. Placement of wooden formwork for Volute                                   | 8. Placement of rotating assembly with Pump Shaft            |
| 4. Volute formwork and Volute Tongue with reinforcement ready for concreting | 9. Coupling being assembled with the Pump Shaft              |
| 5. Placement of Mock up tool for foundation frame for Motor/ Gear box        | 10. Rotating assembly with intermediate shaft                |
|  | 11. Drive motor for pump installed on motor foundation block |

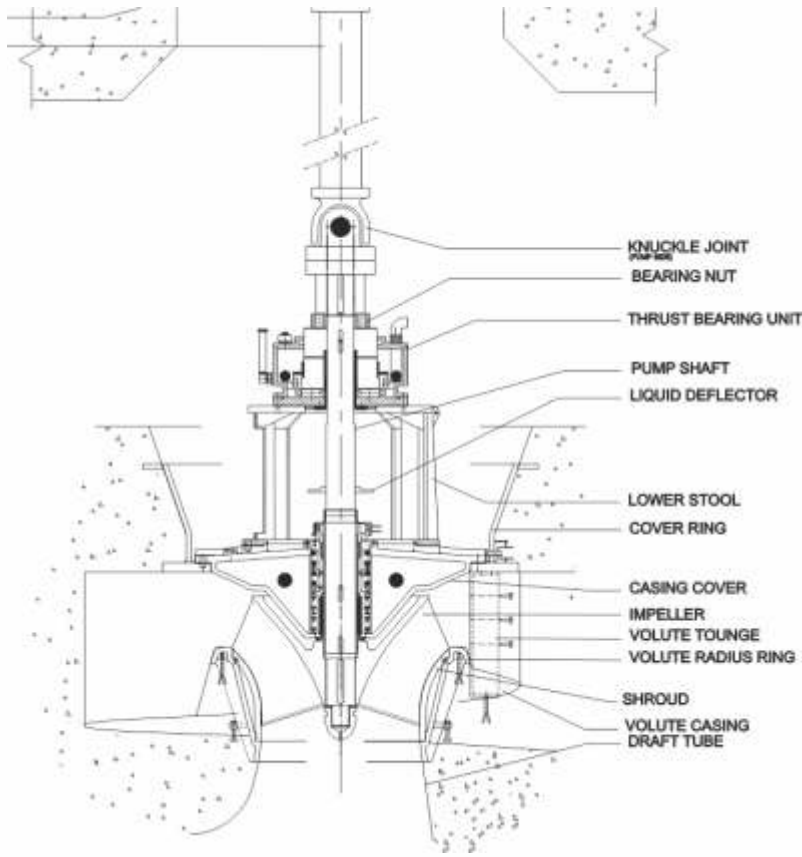
Double Volute type:



Single Volute type:



Cross Sectional Drawing



Material of Construction

Volute Casing		Reinforced Concrete			
Grouted Component	NiCl	SS 316 L	D2 Ni Resist	Alloy Steel	
Casing Cover	NiCl	D2 Ni Resist	D2 Ni Resist	Alloy Steel	
Impeller / Impeller Nut	CF8M	CF3M	Duplex Steel /Super Duplex	Alloy Steel	
Casing Wear Ring / Shroud	CF8M	CF3M	Duplex Steel /Super Duplex	Alloy Steel	
Intermediate Shaft	SS 410	SS 420	SS 420	SS 316	
Pump Shaft / Shaft Sleeve	SS 410	SS 316	Duplex Steel	Alloy Steel	
Bearing Stool	M S	M S	St St	St St	
Coupling	Carbon Steel	Carbon Steel	Cast Steel	Cast Steel	
Divergent Pipe	M S	M S	M S	St St	

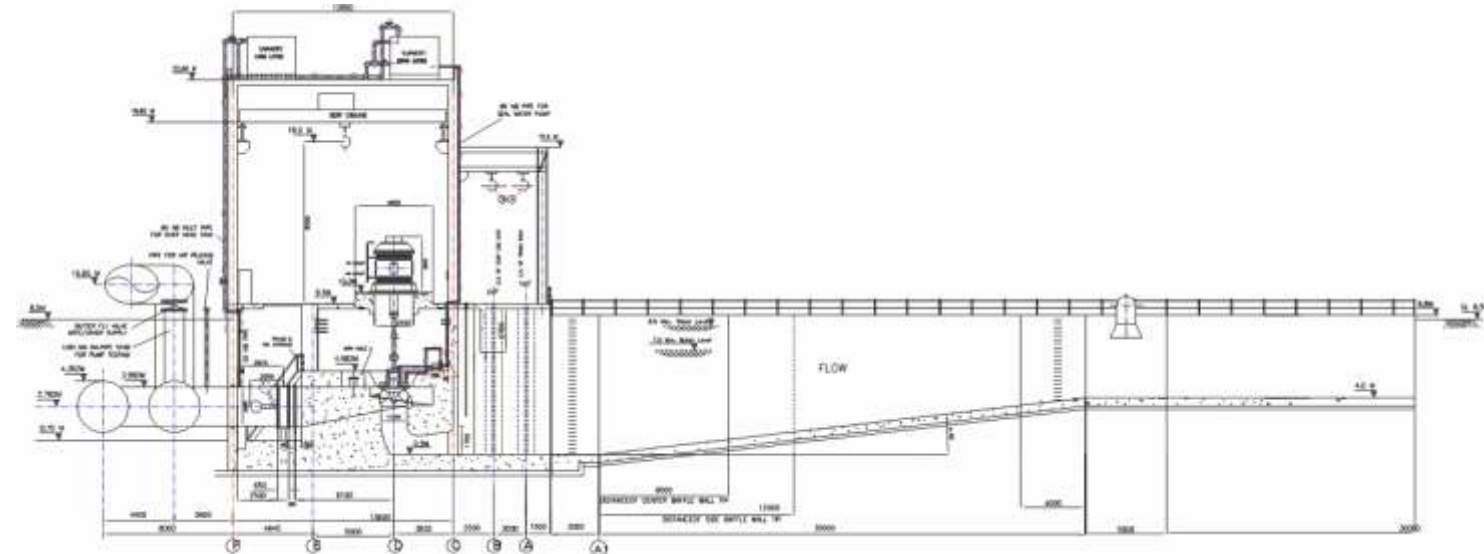
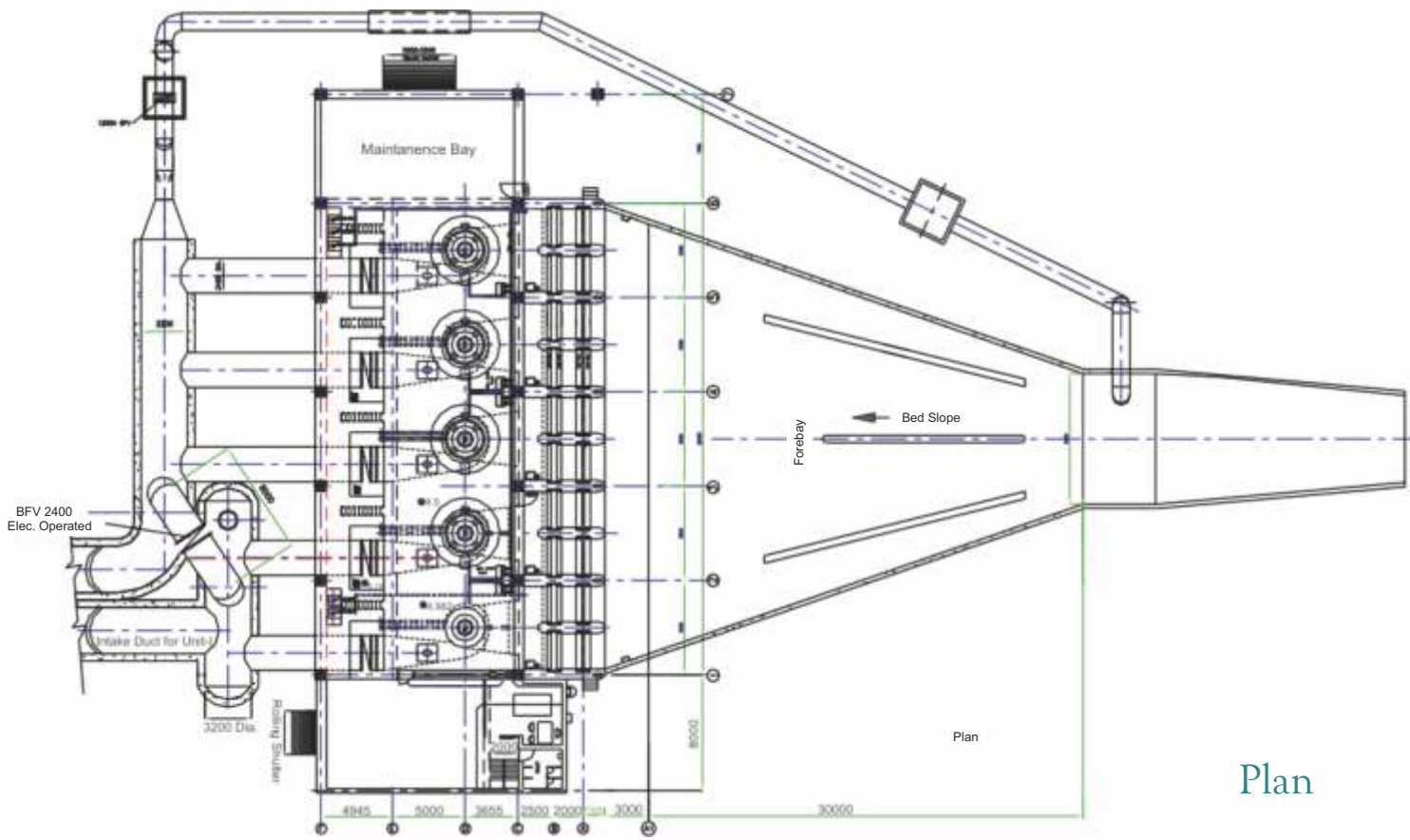
Notes : NiCl Indicates Cast iron with 2 % Nickel.  
Alloy Steel indicates Exotic Materials like Super Duplex Stainless Steels. Other materials are also available on request.

Material Standards

Material	Equivalent International Standards		ASTM
	IS	BS	
Cast Iron	IS 210 Gr FG 260	BS 1452 Gr.250	ASTM-A 48 CL 35
CF8M	IS 3444 Gr.9	BS 1632 Gr.B	ASTM-A 351 Gr. CF8M
CF3M	IS 3444 Gr.9	BS 1632 Gr.B	ASTM-A 743 type 410
SS 410		BS 970 410 S21	ASTM-A 276 Type 410
SS 420		BS 70 420 S21	ASTM-A 276 Type 420
SS 316	IS 1570 Gr. 05 Cr 18 Ni11 Mo3	BS 970 316 S16	ASTM-A 276 Type 316
SS 316L			ASTM-A 240 Gr. 316L
D2 Ni Resist	IS 2749 Gr. AFG Ni 20Cr3.	BS 3468 Aus 102 Gr. B	ASTM-A 436 Type 2
Duplex Steel			ASTM-A 890 Gr. CD4MCu
Mild Steel (MS)	IS 2062		
Carbon Steel	IS 1570 Gr. 40 C 8	BS 970 080 M40	ASTM-A 107 Gr. 1040
Cast Steel		BS 1504 101A	ASTM-A 216 Gr. WCB

Notes : Other Equivalent International Grades can also be offered.

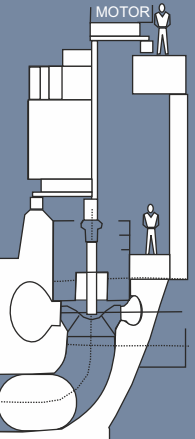
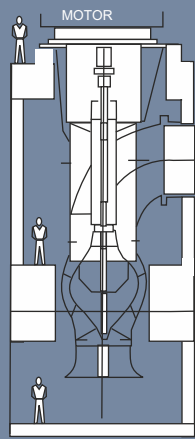
Concrete Volute Pump House for Circulating Water System



Plan

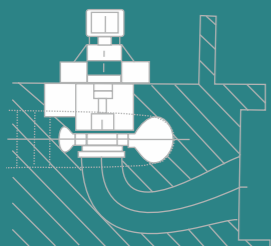
Elevation

Kirloskar  
Concrete Volute Pump

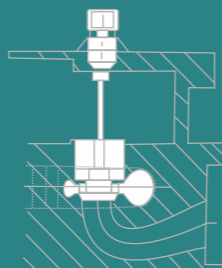


Type	Vertical Metallic Casing Pump	Concrete Volute Pump
Casing	Wet-Pit Corrosion (chemical & electrolytic) External fouling Vibrations, cracks	Dry-Pit No corrosion No erosion No fouling No vibrations
Inspecting / Maintenance	Difficult to maintain Long duration and costly interventions Heavy loads Requires general overhaul at intervals of 2 to 3 years	Minimum maintenance Simple and easy No heavy loads Inspection without dismantling General overhaul at intervals of 5 to 7 years
Intake	Sump or pit Chance of vortices Sand / Silt deposit Irregular flow pattern	Special Hydraulic design No vortices No deposit Stream lined flow pattern
Bearing	Submerged bearing bushes Less reliability Difficult and expensive to maintain	Out of water, no wear Minimum 10 years life Simplified maintenance Easy temperature check
Shaft	In water, subjected to irregular stress and problems. Possibility of vibrations and cracks	Dry, no water contact No corrosion, long life No vibrations

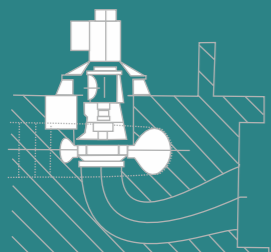
## Alternative Arrangements



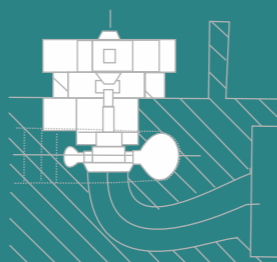
a) High Speed Motor Driving the pump through a reducing Gear Box  
Gear Box on Pump floor + Rigid Coupling



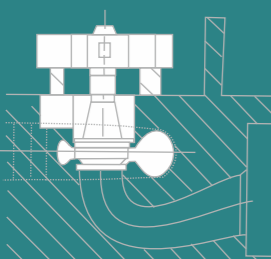
b) High Speed Motor Driving the pump through a reducing Gear Box  
Motor and Gear Box on Upper floor + Rigid Shaft



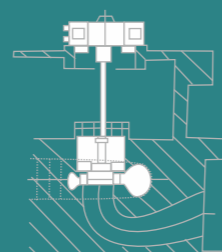
c) High Speed Motor Driving the Pump through a reducing Gear Box  
Gear on Pump Cone



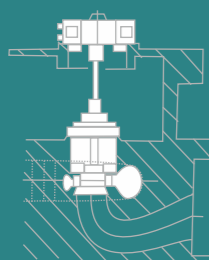
d) Motor Directly coupled and on Pump Floor  
Single Thrust Bearing + Rigid Coupling



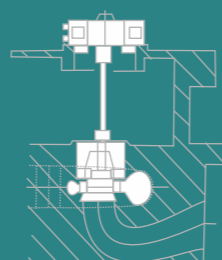
e) Motor Directly coupled and on Pump Floor  
Two Separate Thrust Bearing + Flexible Coupling



f) Motor Directly coupled through extension shafting motor on upper Floor  
Single Thrust Bearing + Rigid Coupling



g) Motor Directly coupled through extension shafting motor on Upper Floor  
- Separate Pump Thrust Bearing on intermediate floor + Flexible Coupling



h) Motor Directly coupled on upper Floor  
Separate Pump Thrust Bearing on Pump Cone + Flexible Coupling

## Concrete Volute Pump Projects

Reliance Energy Ltd. (Formerly BSES Ltd.)  
2 x 250 MW Dahanu Thermal Power Station



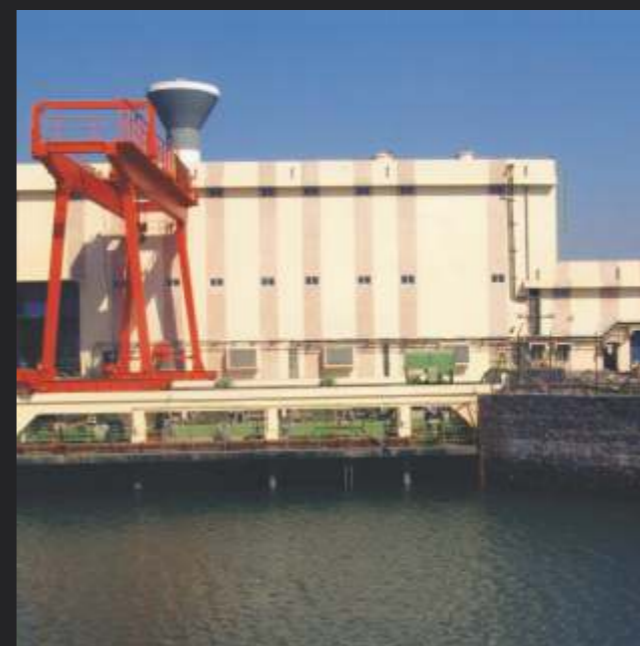
(India's first Concrete Volute Pumps)

Sardar Sarovar Narmada Nigam Limited  
Saurashtra Branch Canal Pumping Scheme



(World's largest Pumping Scheme)

Nuclear Power Corporation of India Limited  
2 x 500 MW Tarapur Atomic Power Plant



National Thermal Power Corporation Limited  
2 x 500 MW Simhadri Super Thermal Power Project



## KBL - USA Patent

## Energy Efficient Siphon System for Pumping System

### Siphon duct installation at Site



USA patent has been awarded for Siphon creation and breaking arrangement designed by KBL team for Concrete Volute and Vertical Turbine Pumps.

### Siphon model Test at Hydraulic lab of KBL

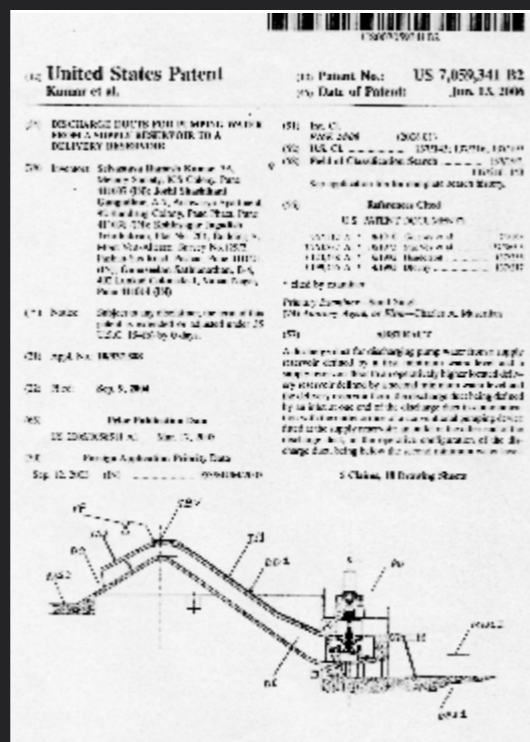


The use of energy efficient Siphon arrangement will provide the following benefits:

Energy Saving in motor rating : 8.5 MW

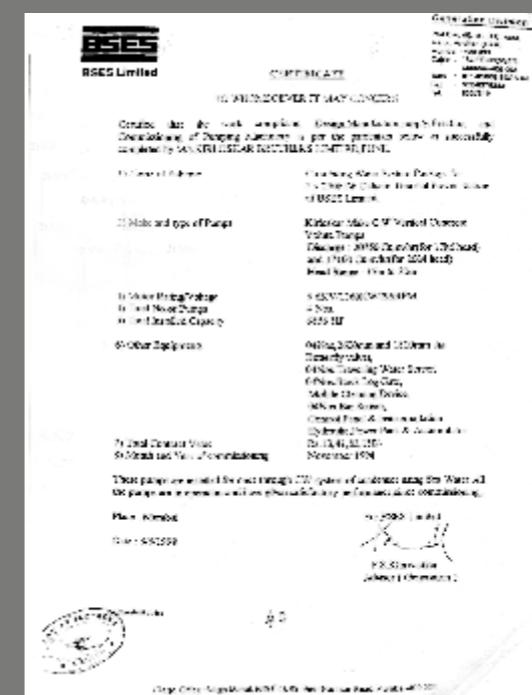
Energy Conservation : 34.96 M units per annum

Saving in electricity : ` 122.3 mn. per annum (US \$ 2.72 mn.)

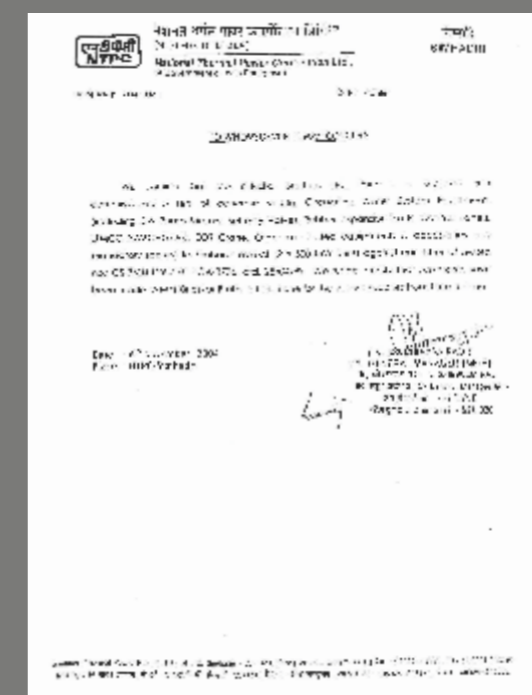


## Accolades

2 x 250 MW Dahanu Thermal Power Project  
of Reliance Energy (BSES, Limited)



2 x 500 MW Simhadri Super Thermal Power Plant



2 x 500 MW Tarapore Atomic Power Project

