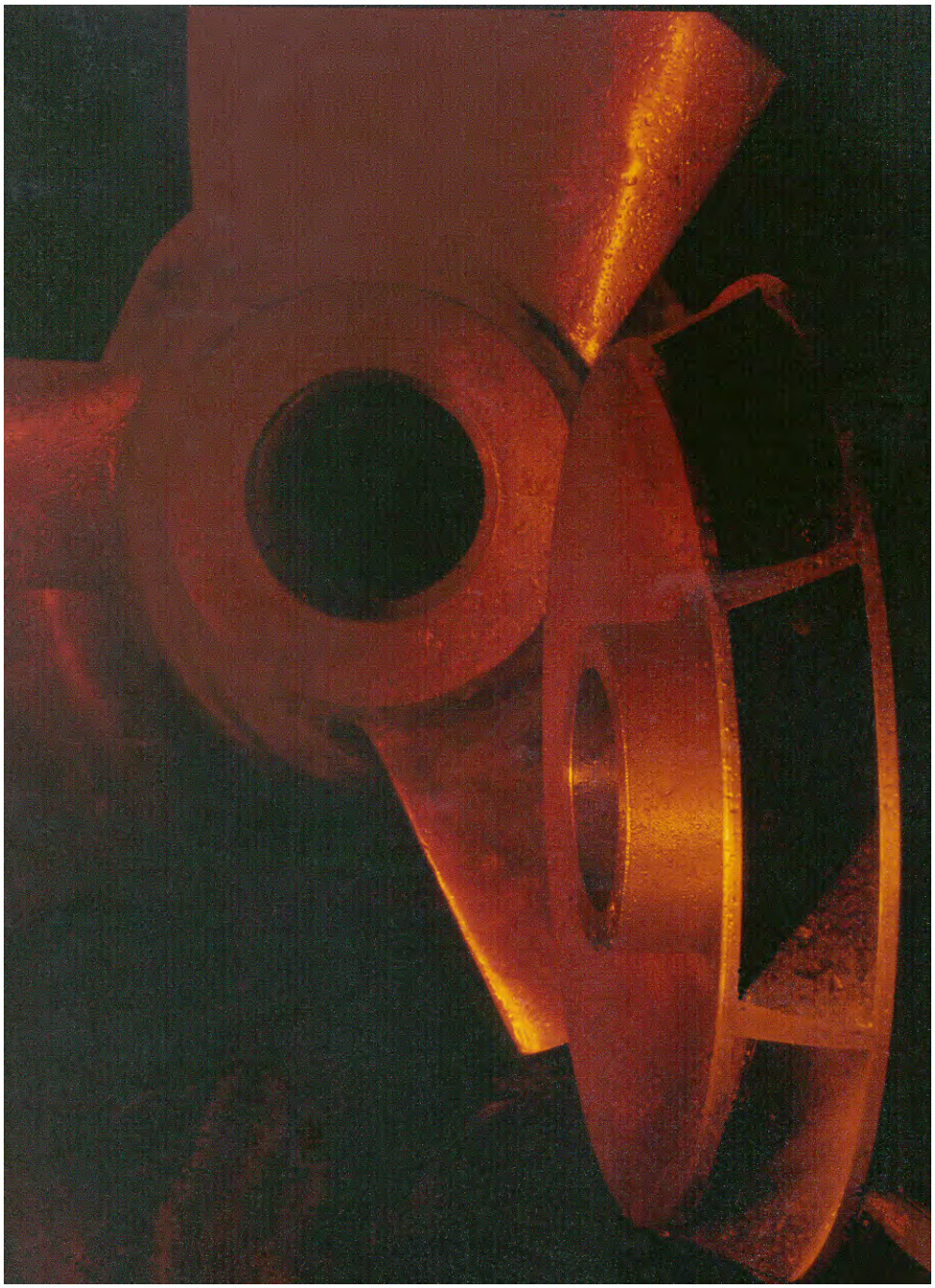
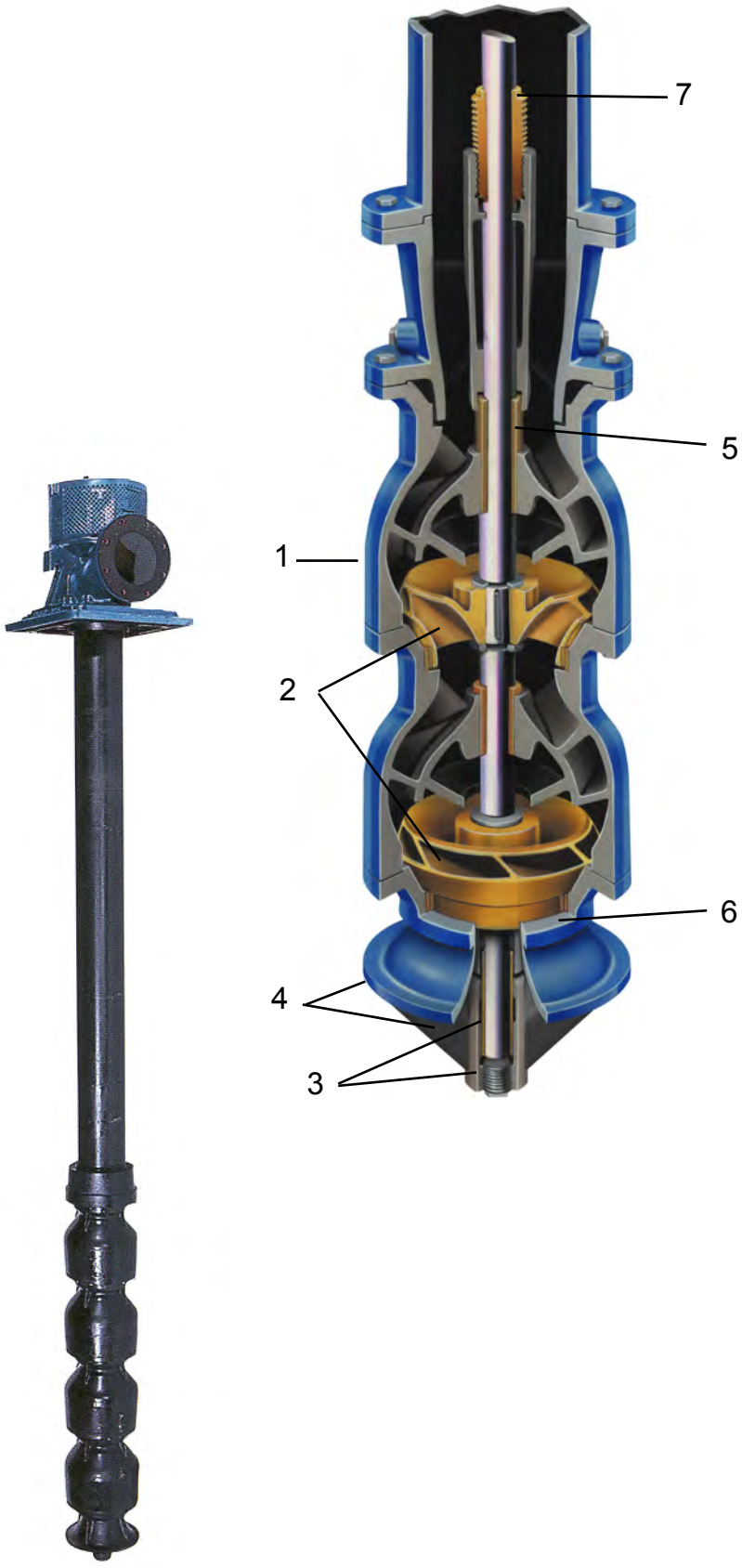
Vertical Turbine & Propeller Pumps



Fairbanks Morse

Pentair Pump Group

Turbine Bowl Assemblies



1. Bowl castings are manufactured of heavy-duty, high quality cast iron, and feature a minimum 30,000 PSI tensile strength, with smooth passages designed for efficient operation. Optional coated passages are available to further pump efficiency. Bowls can be staged to produce higher pressures for a given capacity. (Threaded bowl connections are used in the 6M, 7M and 8M designs.)

2. Enclosed impellers are matched to the pump bowls. The precision-cast impellers are dynamically balanced to avoid vibration. The impellers are secured to the shaft with tapered lock collets. On larger sized units, a key and ring are used to secure the impeller to the shaft. A top shaft adjusting nut or an adjustable coupling provide easy adjustment of clearance between the impellers and bowls.

3. To ensure long life, the suction bearing is grease-packed and fitted with a sand collar to keep grit and abrasives from entering the bearing.

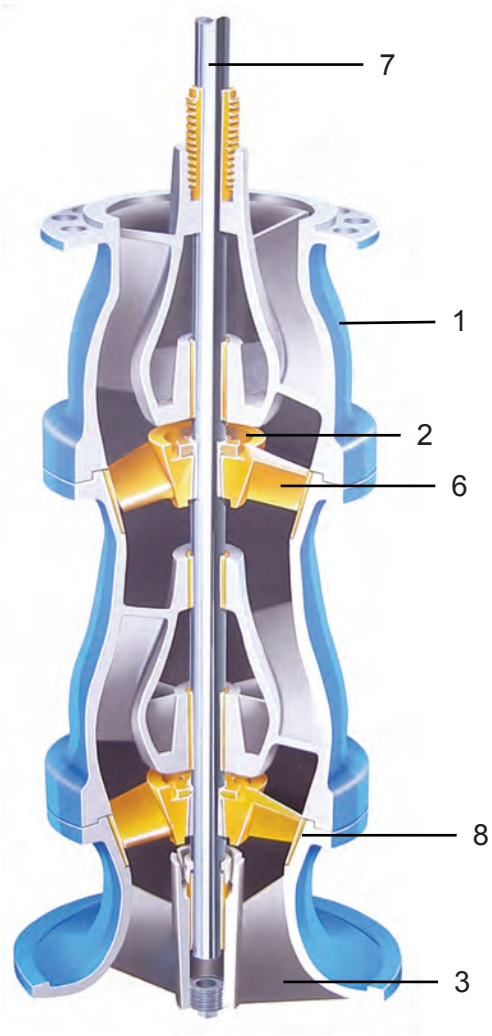
4. The cast iron suction bell and its integrally-cast guide vanes provide a smooth flow into the first stage impeller. This reduces the formation of vortexes and contributes to a more efficient operation.

5. Bowl bearings are lubricated with the liquid pumped, and assure accurate shaft alignment.

6. Impeller and bowl wear rings are available as options to renew impeller clearances when no further external adjustment is possible. These renewable rings enable the owner to restore a worn and inefficient unit to near original condition, extending operation for many years.

7. Where enclosed lineshaft is used, the connector bearings are lubricated with water, oil, or grease, depending upn the lubricant used in the enclosing tube.

Axial & Mixed Flow Bowl Assemblies



1. Heavy-duty high quality cast iron bowl castings with smooth passageways enhance efficient operation.

2. Intermediate and discharge bowl bearings are product-lubricated and designed to carry maximum loads over long service life. The suction bowl bearing is grease-packed and fitted with a sand collar for protection from sand and grit.

3. The suction bell features three or four integrally-cast guide vanes to reduce vortexing and entrance losses. The reduced number of vanes allows for passage of solids.

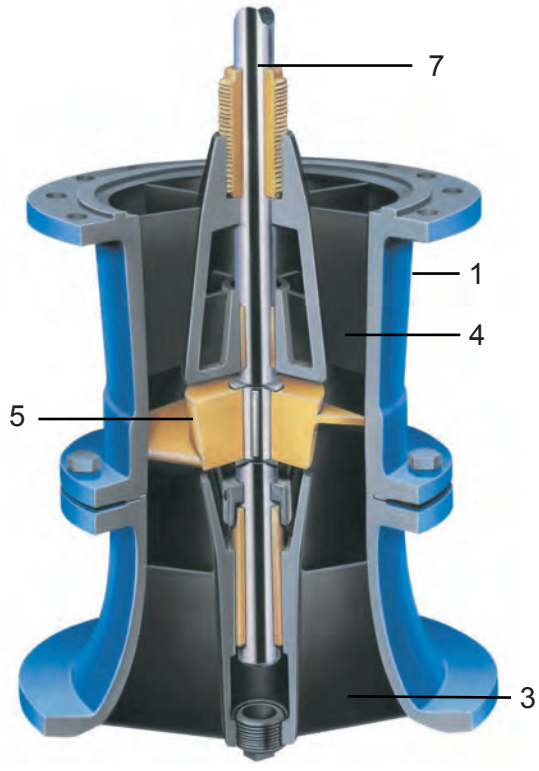
4. Discharge diffuser vanes provide smooth flow entering the discharge column.

5. Axial flow propellers feature well rounded leading edges to prevent accumulation of stringy materials and provide increased solids-passing capabilities. The Model 8211 propellers are secured to the shaft with longitudinal keys and snap rings.

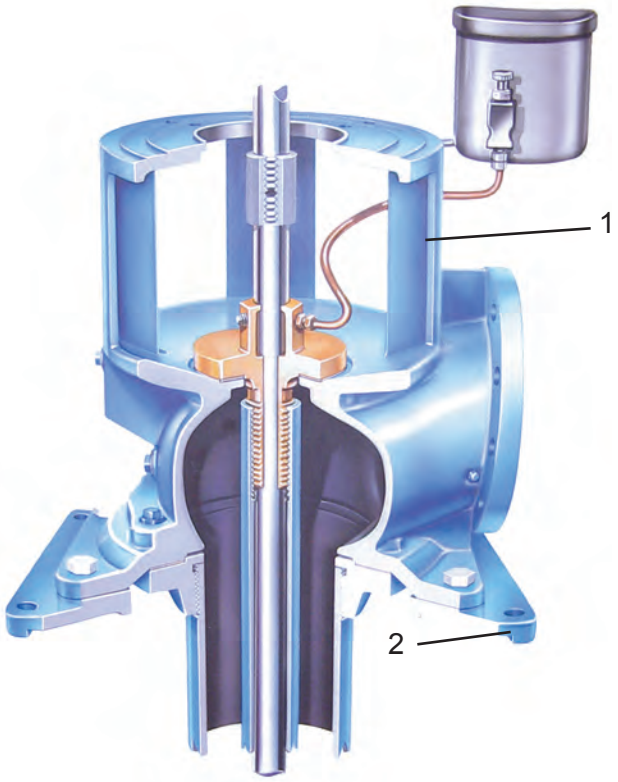
6. The mixed flow propeller design also features well rounded edges and hydrofoil design to pass large diameter solids. These propellers are attached to the shaft with a lock collet and lock nut. (Larger size 8312's also incorporate keys.) All propellers are dynamically balanced to eliminate vibration.

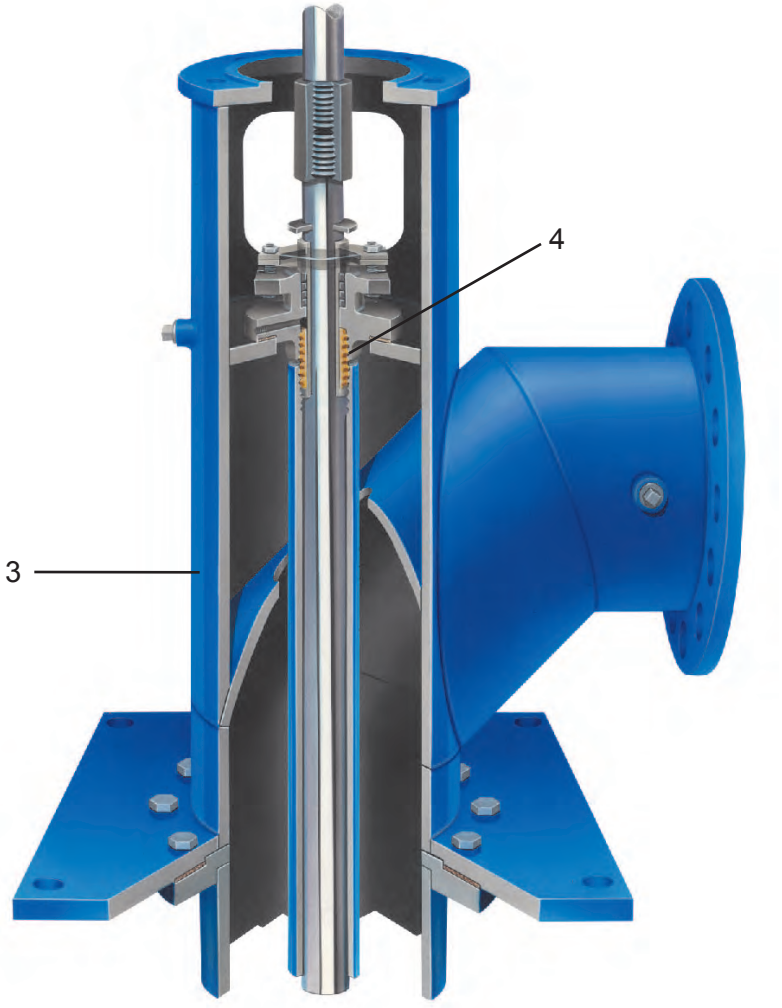
7. Large bowl shafts are of sufficient diameter to transmit the required drive torque.

8. Bowl liners are available to provide a renewable surface and maintain the clearance between the propeller and bowl. Replacement of bowl liners restores worn units to original conditions extending efficient operation for many years.



Discharge Heads





1. Rugged cast iron discharge heads meet sanitary requirements and support the column, lineshaft, and bowl assemblies, while accepting any vertical driver. Large openings allow easy access to the stuffing box or mechanical seal, and smooth passageways ensure reduced friction loss and efficient overall operation. The integrally-cast discharge flange can be either a 125 lb. or 250 lb. design.

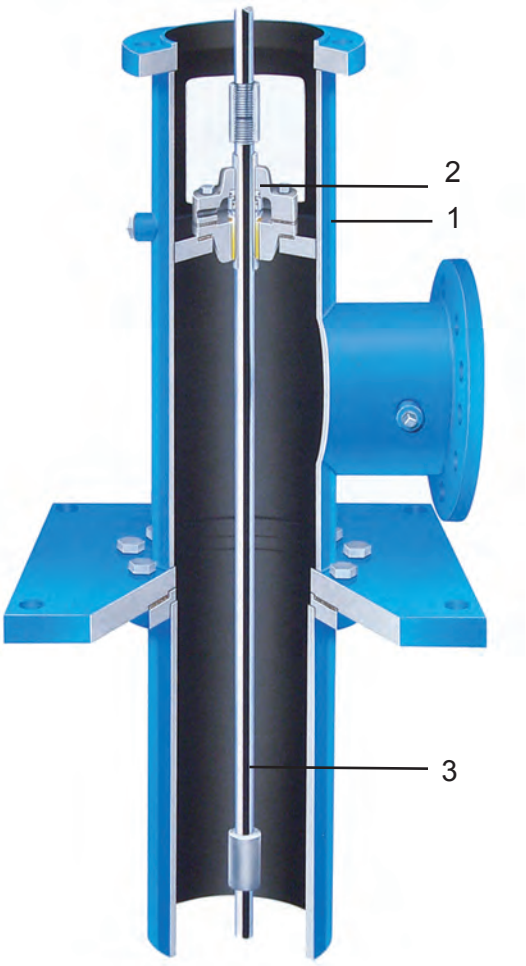
2. Cast iron or steel soleplates for mounting the discharge heads are available. Once the soleplate is leveled and grouted in place, the pump can easily be removed for maintenance, and then reset without realignment.

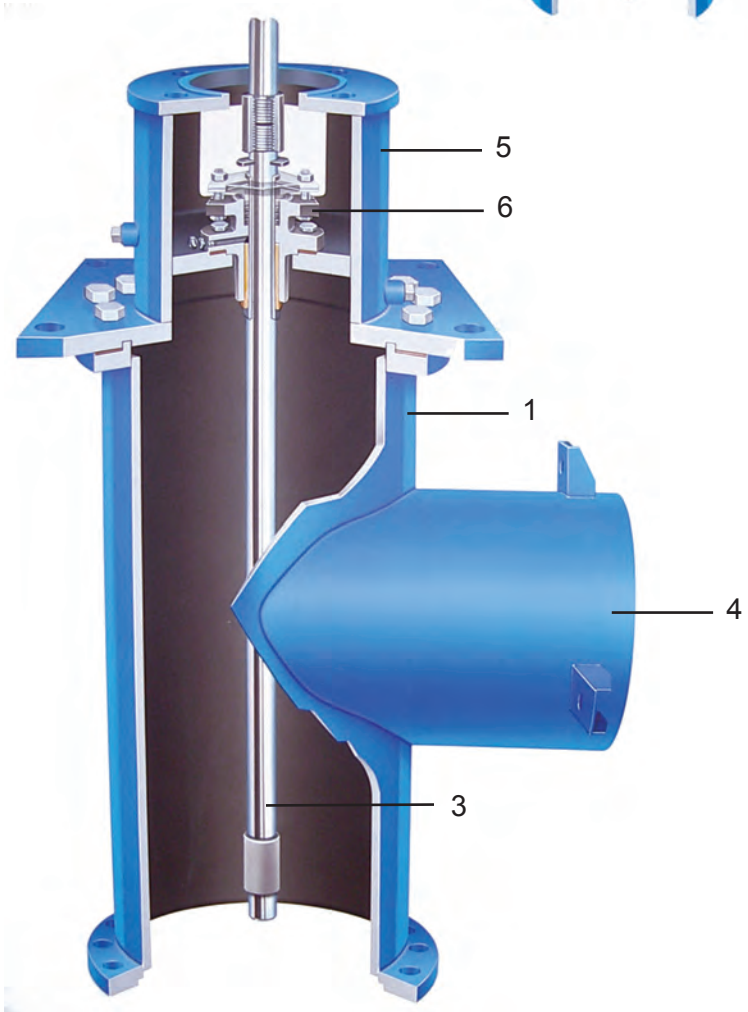
3. Fabricated discharge heads are formed from high quality steel, with the discharge of either flanged or plain-end design.

The flanged discharge is available through 300 lbs. The three-segment elbow design smooths the fluid flow and reduces friction losses, for efficient operation.

4. A water flush lubrication arrangement uses packing or mechanical seal to seal the shaft. An external water source is introduced at the packing or seal and flows through the shaft enclosing tube to lubricate the lineshaft bearings. A renewable sleeve protects the shaft throughout the stuffing box area.

5. All discharge head designs are adaptable to threaded or flanged column.





1. The L-type fabricated discharge heads are designed to accept the column, shaft, and bowl weight as well as the hydraulic thrust. The heads are formed from high quality steel and gusseted providing a rigid base to eliminate vibration and assure smooth operation. Plain-end and flanged discharge designs are available through 300 lb. flange ratings.

2. The shaft can be sealed with most mechanical seals. When mechanical seals are used with a vertical solid shaft driver, a spacer coupling is required to simplify seal maintenance and replacement.

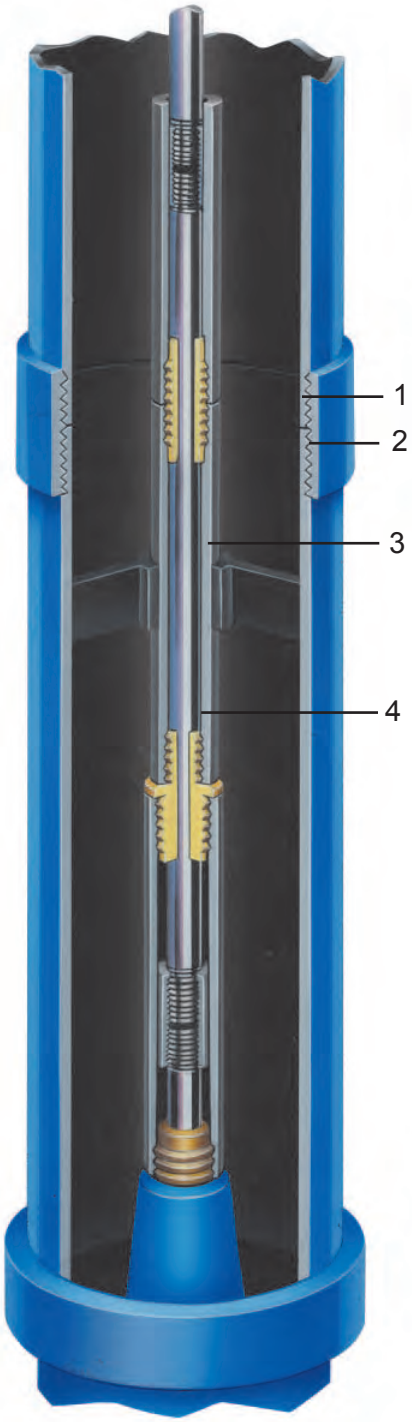
3. Two-piece top shaft construction is supplied for ease of vertical solid shaft driver removal.

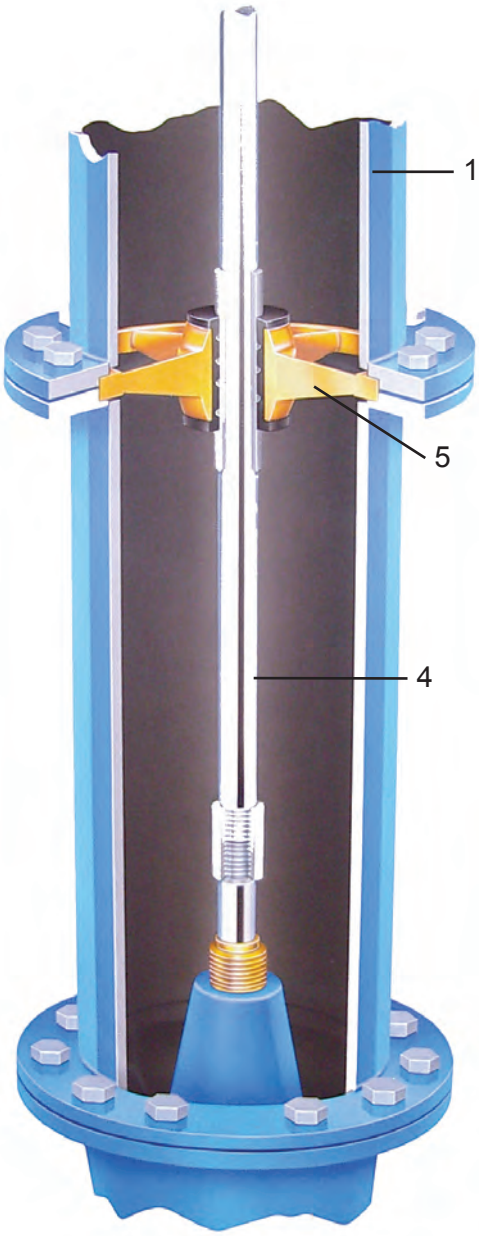
4. Underground discharge elbows are fabricated from high quality steel, and available with either flanged or plain-end discharge. The centerline of discharge may be located any distance below grade.

5. A fabricated steel pedestal provides the means to mount the driver, and provides access to the stuffing box or mechanical seal area. Air release connections are provided above the base plate.

6. The product-lubricated packing box is available through 400 PSI. Packing is a graphited synthetic material. Seepage bypass box is available. Leakage drain connection is provided in the head to permit easy disposal of the liquid present in the packed box arrangement.

Column & Lineshaft Assemblies





1. Threaded steel discharge column is available in standard sizes through 14" diameter. Where greater strength or ease of assembly and disassembly is required, flanged column pipe is also available in these sizes. Welded flanged column is supplied as standard in column sizes 16" and larger.

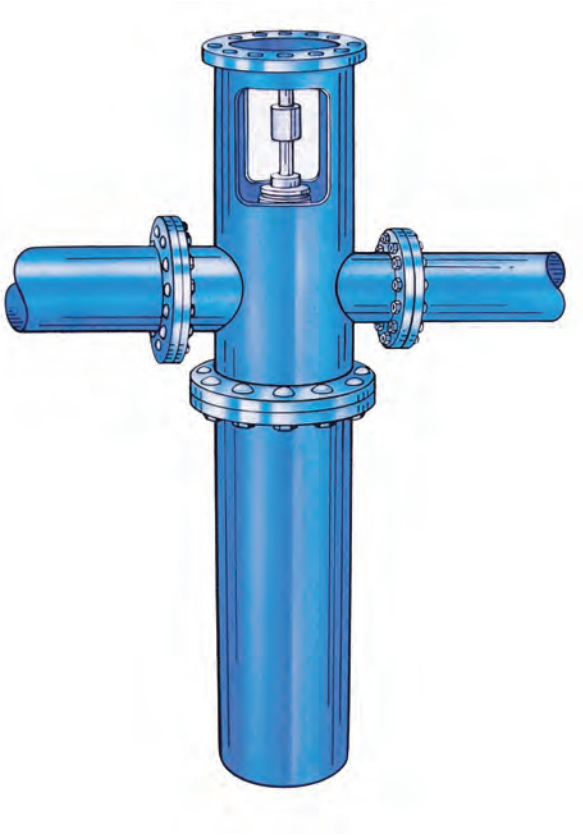
2. On enclosed lineshaft applications, proper alignment is maintained by butting the pipe together within the sleeve-type pipe coupling. When open lineshaft is used, pipe ends are butted on the bearing retainer flange.

3. Use of an enclosing tube protects the lineshaft and bearings from the liquid being pumped. Lubricant may be oil, grease or water flush. Interchangeable sections of five feet in length have machined ends to receive bronze connector bearings. Deep set turbines with an enclosed lineshaft utilize a tube stabilizer approximately every 50 feet of setting.

4. The driver horsepower is transmitted to the bowl assembly through a precision-ground, high tensile strength lineshaft. The shafting is coupled with an extra strong threaded coupling. The shaft size and bearing spacing is selected to meet horsepower and thrust requirements and to avoid operation at critical speeds.

5. In open lineshaft construction, thru 14", bearing retainers house neoprene spiral grooved rubber bearings. The shaft and renewable shaft sleeve rotate within these bearings. In 16" column and larger, the spider/bearing hub is welded in place just below the upper column flange.

Pot Pumps



To meet unique requirements, vertical turbine pumps can be incorporated with a "pot" or "can". These units are typically found in applications where the Net Positive Suction Head Available (NPSHA) is low, in high pressure systems, systems where suction pressures are variable and/or critical, or where differences in the elevation of suction and discharge piping is desired.

Pot pump design flexibility allows for various discharge head and pot configurations to permit suction and discharge locations to be either above- or below-grade. The design is compact, requiring a minimum of floor space. The pot is designed to allow the turbine suction bowl to be submerged for proper NPSHA. The discharge heads are sealed to the pot flange to accommodate temperature and pressure demands. Bowls can be staged to meet hydraulic requirements. The discharge head can be of "C", "D", "L", or "T" type designs.

Pot pumps are used in pipeline (in-line), water booster, boiler feed, condensate, product loading and unloading, and volatile liquids handling applications.

Submersible Turbines

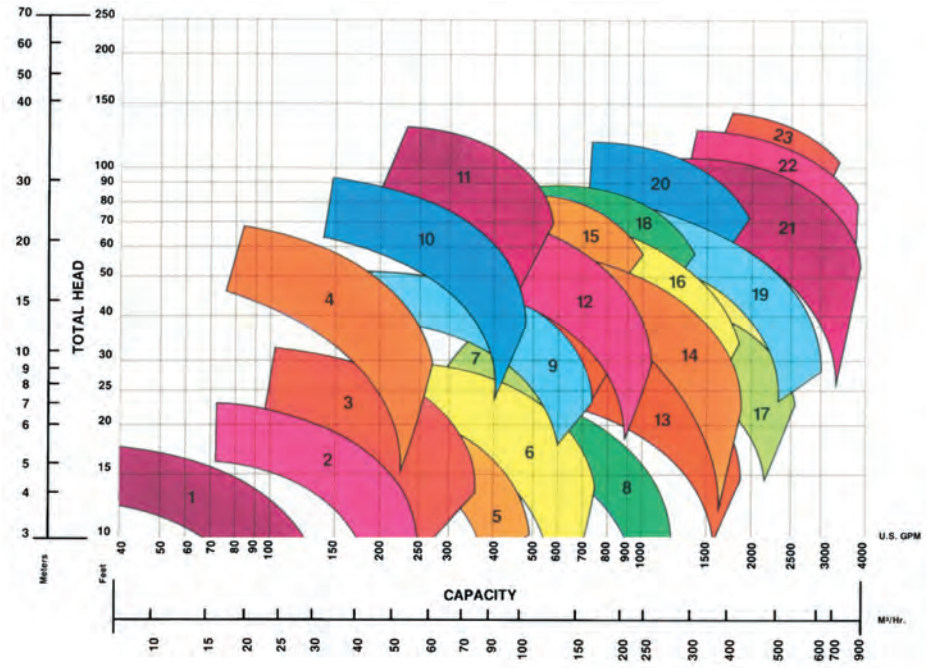
Submersible turbine units perform with the same hydraulics as lineshaft turbines. These units are found in deep-setting, high-head applications where the practical limits of long drive shafts and multiple shaft bearings are exceeded. They are also installed where severe atmospheric conditions such as dust, fumes, and/or high or low temperatures would affect the driver or discharge head sealing arrangement, or where there is a need to install the unit horizontally.

Submersible turbines are driven by a submersible motor coupled directly to the bowl shaft. The discharge piping requires only a simple discharge elbow at the discharge surface. There is no packing box or mechanical seal to maintain. Power to the motor is conducted via a waterproof cable.

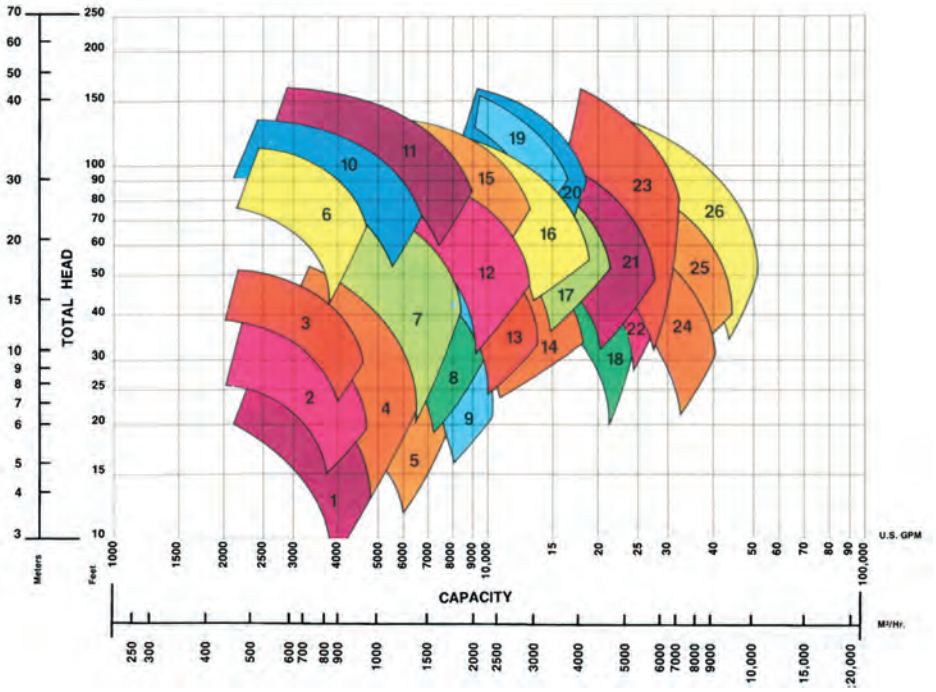
Typical installations for submersible turbines include deep well water supply, in-line booster, service water, irrigation, and mine dewatering. The submersible turbine is ideal for applications in areas where surface equipment is prohibited, or where there are noise restrictions, such as parks or residential locations.

Turbine Performance

1. 6M, 3600 RPM
2. 7M, 3600 RPM
3. 8M, 3600 RPM
4. 6M, 1800 RPM
5. 10M, 1200 RPM
6. 11M, 1200 RPM
7. 12L, 1200 RPM
8. 11H, 1200 RPM
9. 10M, 1800 RPM
10. 7M, 1800 RPM
11. 8M, 1800 RPM
12. 11M, 1800 RPM
13. 13H, 1200 RPM
14. 11H, 1800 RPM
15. 12L, 1800 RPM
16. 12H, 1800 RPM
17. 15H, 1200 RPM
18. 12M, 1800 RPM
19. 13H, 1800 RPM
20. 14M, 1800 RPM
21. 15H, 1800 RPM
22. 16HC, 1800 RPM
23. 18MC, 1800 RPM



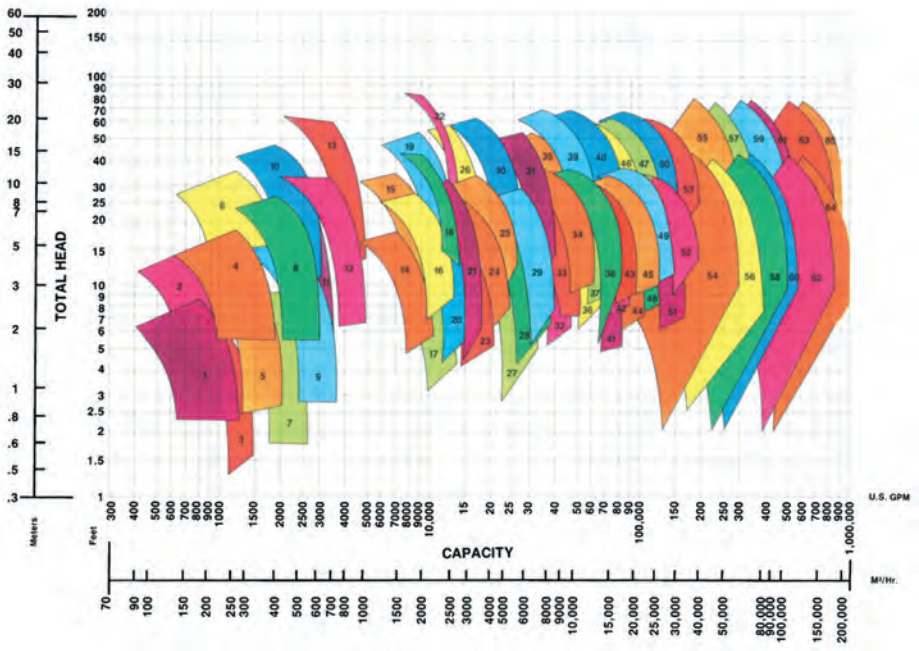
1. 20H, 720 RPM
2. 21H, 900 RPM
3. 17H, 1200 RPM
4. 20H, 900 RPM
5. 23H, 720 RPM
6. 17M, 1800 RPM
7. 20H, 1200 RPM
8. 23H, 900 RPM
9. 26H, 720 RPM
10. 17H, 1800 RPM
11. 21H, 1800 RPM
12. 23H, 1200 RPM
13. 26H, 900 RPM
14. 20H, 720 RPM
15. 27M, 1200 RPM
16. 26H, 1200 RPM
17. 30H, 900 RPM
18. 48HC, 440 RPM
19. 50M, 1200 RPM
20. 28XHC, 1200 RPM
21. 30H, 900 RPM
22. 48HC, 500 RPM
23. 36XHC, 900 RPM
24. 51H, 440 RPM
25. 57H, 500 RPM
26. 57H, 580 RPM



Axial Flow Performance

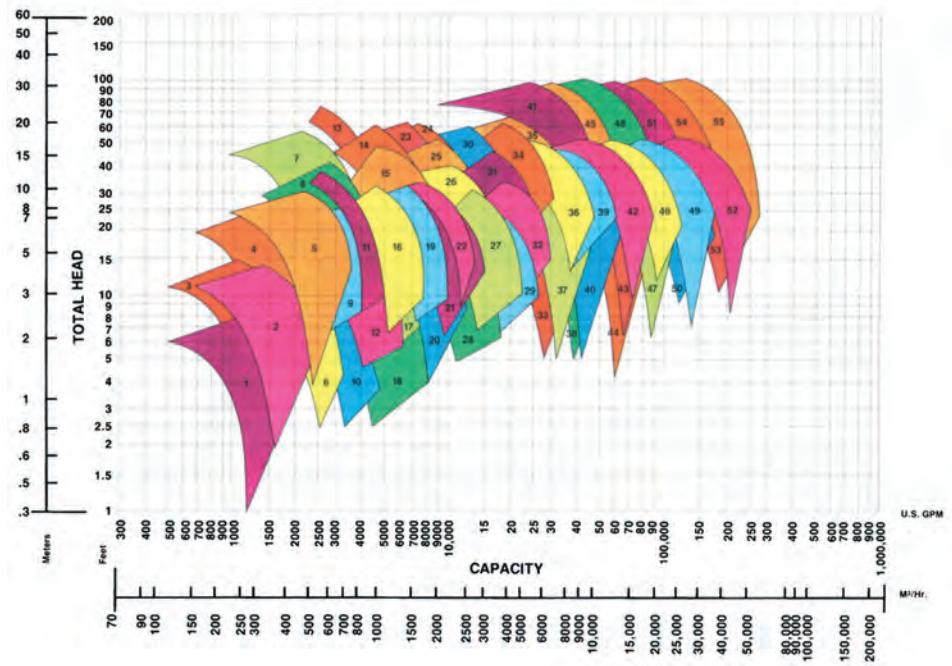
1. 8" - 1170 RPM, 1-STG
2. 8" - 1170 PRM, 2-STG
3. 10" - 880 RPM, 1-STG
4. 8" - 1770 RPM, 1-STG
5. 10" - 1170 RPM, 1-STG
6. 8" - 1770 RPM, 2-STG
7. 12" - 880 RPM, 1-STG
8. 10" - 1770 RPM, 1-STG
9. 12" - 1170 RPM, 1-STG
10. 10" - 1770 RPM, 2-STG
11. 12" - 1170 RPM, 2-STG
12. 12" - 1770 RPM, 1-STG
13. 12" - 1770 RPM, 2-STG
14. 20" - 705 RPM, 1-STG
15. 20" - 705 RPM, 2-STG
16. 20" - 880 RPM, 1-STG
17. 24" - 580 RPM, 1-STG
18. 20" - 1170 RPM, 1-STG
19. 20" - 880 RPM, 2-STG
20. 24" - 705 RPM, 1-STG
21. 24" - 880 RPM, 1-STG
22. 20" - 1170 RPM, 2-STG
23. 30" - 500 RPM, 1-STG
24. 30" - 580 RPM, 1-STG
25. 30" - 500 RPM, 1-STG
26. 24" - 880 RPM, 2-STG
27. 36" - 435 RPM, 1-STG
28. 30" - 580 RPM, 1-STG
29. 36" - 580 RPM, 1-STG
30. 30" - 705 RPM, 2-STG
31. 36" - 580 RPM, 2-STG
32. 42" - 390 RPM, 1-STG
33. 42" - 435 RPM, 1-STG
34. 42" - 500 RPM, 1-STG
35. 42" - 435 RPM, 2-STG
36. 48" - 350 RPM, 1-STG
37. 48" - 390 RPM, 1-STG
38. 48" - 435 RPM, 1-STG
39. 42" - 500 RPM, 2-STG
40. 48" - 435 RPM, 2-STG
41. 54" - 290 RPM, 1-STG
42. 54" - 320 RPM, 1-STG
43. 54" - 350 RPM, 1-STG
44. 60" - 270 RPM, 1-STG
45. 60" - 320 RPM, 1-STG
46. 54" - 320 RPM, 1-STG
47. 60" - 320 RPM, 2-STG
48. 63" - 270 RPM, 1-STG
49. 63" - 320 RPM, 1-STG
50. 63" - 320 RPM, 2 -STG
51. 72" - 235 RPM, 1-STG
52. 72" - 270 RPM, 1-STG
53. 72" - 270 RPM, 2-STG
54. 84" - 1-STG*
55. 84" - 1-STG*
56. 104" - 1-STG*
57. 104" - 2-STG*
58. 110" - 1-STG*
59. 110" - 2-STG*
60. 116" - 1-STG*
61. 116" - 2 STG*
62. 132" & 144" - 1 STG
63. 132" & 144" - 2 STG
64. 152" - 1 STG*
65. 152" - 2 STG*

*Various RPM's



Mixed Flow Performance

1. 10" - 880 RPM, 1-STG
2. 10" - 1170 PRM, 1-STG
3. 10" - 880 RPM, 2-STG
4. 10" - 1170 RPM, 2-STG
5. 10" - 1770 RPM, 1-STG
6. 12" - 880 RPM, 1-STG
7. 10" - 1170 RPM, 2-STG
8. 12" - 1170 RPM, 2-STG
9. 12" - 1170 RPM, 1-STG
10. 14" - 705 RPM, 1-STG
11. 12" - 1 770 RPM, 1-STG
12. 14" - 880 RPM, 1-STG
13. 12" - 1770 RPM, 2-STG
14. 14" - 1170 RPM, 2-STG
15. 16" - 880 RPM, 2-STG
16. 14" - 1170 RPM, 1-STG
17. 16" - 880 RPM, 1-STG
18. 16" - 705 RPM, 1-STG
19. 16" - 1170 RPM, 1-STG
20. 20" - 880 RPM, 1-STG
21. 20" - 705 RPM, 1-STG
22. 20" - 880 RPM, 1-STG
23. 16" - 1170 RPM, 2-STG
24. 20" - 880 RPM, 2-STG
25. 20" - 705 RPM, 2-STG
26. 24" - 580 RPM, 2-STG
27. 24" - 705 RPM, 1-STG
28. 24" - 580 RPM, 1-STG
29. 30" - 500 RPM, 1-STG
30. 24" - 705 RPM, 2-STG
31. 30" - 500 RPM, 2-STG
32. 30" - 580 RPM, 1-STG
33. 30" - 435 RPM, 1-STG
34. 30" - 580 RPM, 2-STG
35. 30" - 500 RPM, 2-STG
36. 30" - 580 RPM, 1-STG
37. 30" - 500 RPM, 1-STG
38. 36" - 390 RPM, 1-STG
39. 36" - 500 RPM, 1-STG
40. 36" - 435 RPM, 1-STG
41. 30" - 580 RPM, 2-STG
42. 42" - 435 RPM, 1-STG
43. 42" - 390 RPM, 1-STG
44. 42" - 350 RPM, 1-STG
45. 36" - 500 RPM, 2 -STG
46. 48" - 350 RPM, 1-STG
47. 48" - 320 RPM, 1-STG
48. 42" - 435 RPM, 2-STG
49. 60" - 290 RPM, 1-STG
50. 60" - 250 RPM, 1-STG
51. 48" - 350 RPM, 2-STG
52. 72" - 250 RPM, 1-STG
53. 72" - 220 RPM, 1-STG
54. 60" - 290 RPM, 2-STG
55. 72" - 250 RPM, 2-STG



Construction Features Bowl Assemblies Propeller and Turbine

6M thru 17H-7000

21H thru 57H-7000

16H thru 48H-6900

8211 thru 12"

8211 20" and larger

8312 thru 14"

8312 16" and larger

X **Available Optional Construction**

Type	Vertical, One or Multi-Stage							
	Vertical, One or Two-Stage, Axial Flow							
	Vertical, One or Two-Stage, Mixed Flow							
Rotation	CCW, Viewed From Driven End							
Strainer	Conical or Basket Type	X						
	Clip-On Type Basket		X	X	X	X	X	X
Bowls	Intermediate and Discharge, Diffuser Type; Threaded or Bell Suction (Threaded Suction Only on 10XH, 12XH, 14HX)							
	Intermediate and Discharge, Diffuser Type; Bell Suction							
	Flanged Suction Adapter	X						
	Intermediate and Discharge, Diffuser Type; Bell Suction with Radial Vanes							
Impellers	Enclosed Impeller, Attached to Pumpshaft with Lock Collet							
	Enclosed Impeller, Attached to Pumpshaft with a Thrust Washer and Snap Ring							
	Enclosed Impeller (6920), Attached to Pumpshaft with Lock Collet and Key							
	Semi-open Impeller (6970), Attached to Pumpshaft with Lock Collet and Key							
Propellers	Axial Flow Type, Attached to Pumpshaft with Thrust Snap Rings and Key							
	Mixed Flow Type, Attached to Pumpshaft by Lock Collets and Lock Nuts							
	Mixed Flow Type:16" and 20" Attached to Pumpshaft by Lock Collets and Lock Nuts; 24" and 30" Also Use Keys							
Suction Case Bearing	Sleeve Type, Grease Packed							
Intermediate Bowl Bearing	Sleeve Type, Product Lubricated							
Top Intermediate Bowl Bearing	Sleeve Type, Product Lubricated							
Discharge Bowl Cover Bearing	Sleeve Type, Product Lubricated							
Discharge Bowl Upper Bearing	Threaded Tube Connector, Spiral Groove, Product Lubricated							
	Threaded Tube Connector, Spiral Groove, External Source Lubricated (oil or water)							
Bowl Shaft	Threaded for Shaft Coupling							
	Threaded for Shaft Coupling, Grooved for Snap Rings and with Keyways							

Products comply with various sections of the API-610, AWWA and the Hydraulic Institute. Details are available on application.

Applications

Many elements go into the successful application of vertical pumps - turbine, mixed flow, and axial flow designs. In addition to knowing the capacity and discharge head requirements, other factors to be analyzed include:

** Total pump thrust
** Net Positive Suction Head Available (NPSHA) and submergence
** Allowable bowl pressure
** Allowable pump shaft stretch
** Horsepower required throughout the pump's operating range
** Allowable discharge head hanging weight
** Sump requirements

Other considerations include:

** The parameters of the liquid being pumped
** Allowable solid size
** Type of lineshaft lubrication
** Type of lineshaft sealing
** Elevation
** Driver requirements
** Materials of construction

Fairbanks Morse Pump vertical turbine/propeller pumps are proven performers and are found in a multitude of applications using wells, lakes, cooling ponds, tanks, rivers, and oceans as the water source. These applications include liquid transfer, cooling water circulation, process services, volatile fluids, condensate, booster service, fuel pumps, mine dewatering, storm water, flood control, and marine - in a variety of markets including urban and rural municipal water, irrigation, chemical processing, primary metals, petroleum, power plants, mines, food processing, offshore platforms and more.

Features

The parameters of vertical pumping applications require the units be available in a variety of pumping configurations to meet user needs. Fairbanks Morse meets these demands by providing pump bowls from 4" to 152" in diameter. Turbine bowls can be staged in series to produce discharge pressures in excess of 2,000 feet (865 psi) with flows to 95,000 GPM. Axial and mixed-flow propeller pumps manufactured by Fairbanks Morse are capable of capacities in excess of 1,000,000 GPM, and are used where head requirements are relatively low.

Materials of construction include cast iron, bronze, and stainless steel, or other machinable materials. Wear rings are available to provide a renewable surface.

Open lineshafts allow the product to lubricate the shaft bearings. Enclosed lineshafts can provide external water flush, oil, or grease-bearing lubrication. Threaded or flanged column and lineshaft assemblies are available in both short and deep-set applications.

The drive shaft extending through the discharge head can be sealed using either packing or mechanical seals. A wide range of mechanical seal designs are available along with an assortment of packing box designs, including those for high-pressure applications. Fairbanks Morse also offers an array of discharge head designs, including cast iron or fabricated steel construction, above- or below-ground discharge, and flanged or plain-end discharge connections.

Vertical pumps require a minimum of NPSH since the lowest impeller is submerged in the liquid. However, even when the system design does not provide enough NPSH, the vertical turbine pump can be supplied with its own reservoir or "pot." In this way, the submergence required by the first stage impeller can be achieved to insure reliable performance.

Vertical turbine and propeller pumps can be driven by vertical hollow-shaft motors, vertical solid-shaft motors, or through right-angle gears by an internal combustion engine, steam turbine, or horizontal motor. When vertical hollow-shaft drivers are used, impeller-to-bowl clearances can be maintained with an adjusting nut located at the top of the driver. When vertical solid-shaft drivers are utilized, impeller clearance is regulated with an adjustable coupling.

Fairbanks Morse Pump

In addition to our vertical turbine and propeller pumps, Fairbanks Morse manufactures a broad range of pumps for public works and industrial installations, including dry pit and submersible solids-handling, horizontal and vertical splitcase, vortex and chopper pumps, and a complete line of FM-Approved and UL Listed fire pumps (both electric motor and diesel engine driven), and domestic jet and submersible well pumps.

Our 400,000 square foot manufacturing facility, located in the heart of the United States, provides advanced engineering and technology, a major testing facility for product performance evaluation, and computerized machining centers for high-quality manufacturing techniques. Fairbanks Morse sales and service facilities are located across the United States and throughout the world.

At Fairbanks Morse our longevity, engineered products, R&D programs, market leadership and customer service are the direct result of the quality and dedication of our personnel. Our skilled personnel average over 23 years of experience. Working as a team, our people are continuously exploring new and better ways to serve our customers. Product quality, dependability and innovation are all part of the Fairbanks Morse commitment to excellence.

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FM307/0304