

**VERTICAL TURBINE
AND
PROPELLER PUMPS**

INTRODUCTION

Vertical Turbine and Propeller Pumps

Model 7000 Series Turbine Pump

Model 8200 Series Axial Flow Propeller Pump

Model 8300 Series Mixed Flow Propeller Pump

Vertical Turbine Pumps have wide head ranges and bowls up to 57" (144.78 cm). These pumps are ideal for applications where surface equipment is prohibited, or where there are sound restrictions, such as in parks or residential areas.

Axial Flow Propeller Pumps from Fairbanks Morse are designed for *high volume fluid movement at low discharge pressures*. Used extensively for pumping water from lakes, cooling ponds, tanks, rivers and oceans, typical applications include raw water intake, dewatering, storm water removal, and flood control. Fairbanks Morse vertical axial flow propeller pump applications are found in a variety of markets including urban and rural municipal water, government, industrial and irrigation, and more.

Vertical Mixed Flow Pumps are typically used wherever a *moderate volume of liquid needs to be pumped upward at moderate pressure*. The advantages of mixed flow pumps include minimum footprint, no priming required (because the pump bowl assembly is submerged), and Net Positive Suction Head Available (NPSHA) at the lowest level to satisfy the NPSHA requirements of the pump. In addition, vertical mixed flow pumps are easily adaptable to various design codes, can be modified for changing hydraulic conditions, and generally experience less wear due to the lower operating speeds they require.



SPECS AT A GLANCE

As shown below, pump bowls vary widely. Turbine bowls can be staged in a series to produce discharge pressures exceeding the outputs shown. Each of our pump models 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 motors.



PUMP DECISION FACTORS

Selection of a turbine, mixed flow, or axial flow pump requires an assessment of capacity and discharge head requirements, as well as:

- 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

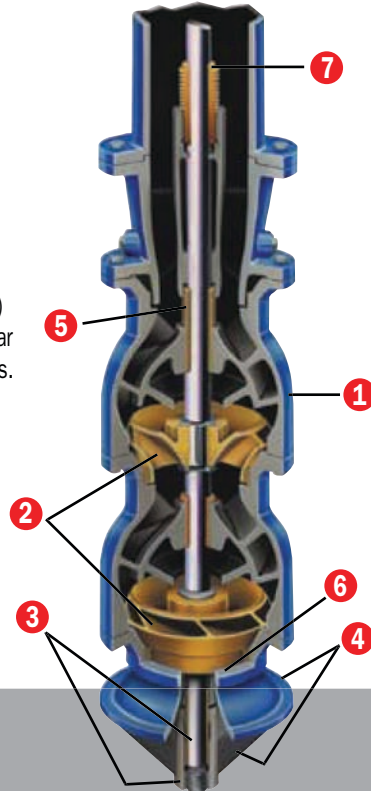
In addition, it is important to consider the following as well:

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

	7000 Series Vertical Turbine Pumps	8200 Series Axial Flow Propeller Pump	8300 Series Mixed Flow Propeller Pump
Capacity Ranges GPM	40 – 50,000 GPM	500 – 1,000,000 GPM	600 – 250,000 GPM
Capacity Ranges m ³ /h	9.08 – 11,350 m ³ /h	113.5 – 227,000 m ³ /h	136.2 – 56,750 m ³ /h
Head Ranges feet	10 – 2,000 Feet	2 – 80 Feet	1.5 – 100 Feet
Head Ranges meters	3.3 m – 660 m	20.32m – 386.08 m	.495 m – 33 m
Pump Bowl Sizes inches	4" – 57"	8" – 152"	10" – 72"
Pump Bowl Sizes meters	10.16 cm – 144.78 cm	.66 m – 26.4 m	25.4 cm – 182.88 cm
Applications			
Raw Water Intake	◆	◆	◆
Dewatering	◆	◆	◆
Liquid Transfer	◆		
Cooling Water Circulation	◆		
Booster Service	◆		
Storm Water Removal	◆	◆	◆
Flood Control	◆	◆	◆
Marine	◆		
Process Services	◆		
Volatile Fluids	◆		
Condensate	◆		
Fuel Pumps	◆		

TURBINE BOWL ASSEMBLIES

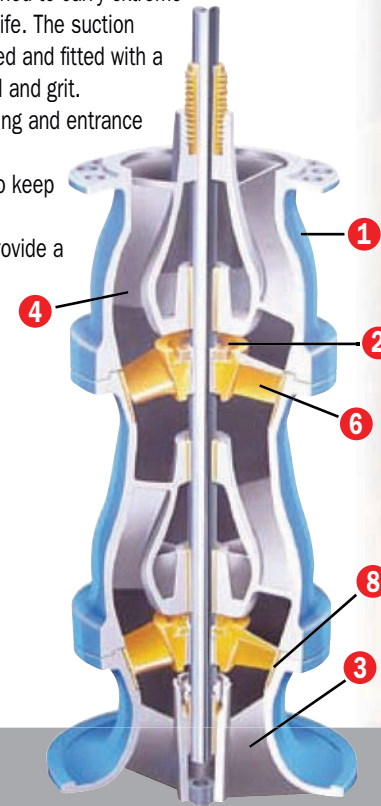
- 1. Bowl Castings** are manufactured of heavy-duty, high quality cast iron, and feature a minimum 30,000 PSI (2068.9 Bar) tensile strength, with smooth passages designed for efficient operation. Optional coated passages can also be used to further increase pump efficiency.
- 2. Enclosed Impellers** are precision-cast, matched to the pump bowls and are dynamically balanced to avoid vibration. A top shaft adjusting nut (or adjustable coupling) makes it easy to adjust impeller-to-bowl clearance.
- 3. Suction Bearings** are grease-packed and fitted with a sand collar to keep grit and other abrasives out of the bearing, ensuring long life.
- 4. Cast Iron Suction Bell** with integrally cast guide vanes provides a smooth flow into the first stage impeller and reduces the formation of vortices, further contributing to efficient operation.
- 5. Bowl Bearings** are lubricated with the liquid pumped and assure accurate shaft alignment.
- 6. Renewable Impeller And Bowl Wear Rings** (optional) allow you to restore a worn and inefficient unit to near original condition, extending operation for many years.
- 7. Connector Bearings** are lubricated with water, oil, or grease, depending upon the lubricant used in the enclosing tube. Connector bearings are employed when an enclosed lineshaft is used.



AXIAL AND MIXED FLOW BOWL ASSEMBLIES

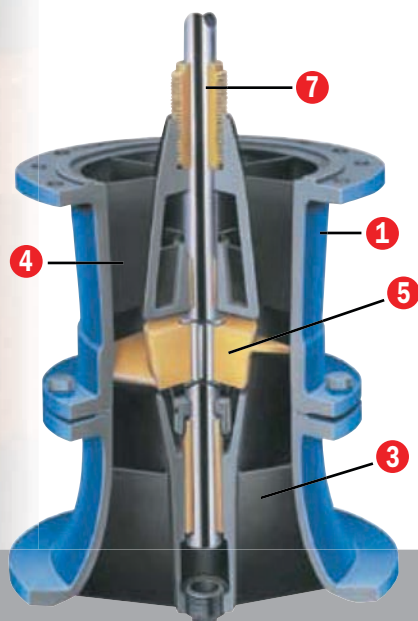
Mixed flow pumps are very similar to axial flow pumps; however, they impart a radial motion and swirling momentum to fluid as it moves through the rotor section. Axial and mixed flow bowls have small footprints, so they are used widely in residential wells, municipal water works, and industrial applications.

- 1. Bowls** are heavy-duty cast iron with smooth passageways to increase efficient operation.
- 2. Intermediate And Discharge Bowl Bearings** are product-lubricated and designed to carry extreme loads for maximum service life. The suction bowl bearing is grease-packed and fitted with a sand collar to keep out sand and grit.
- 3. Suction Bell** reduces vortexing and entrance losses through three or four integrally-cast guide vanes to keep passages clog-free.
- 4. Discharge Diffuser Vanes** provide a smooth flow entering the discharge column.



DISCHARGE HEADS

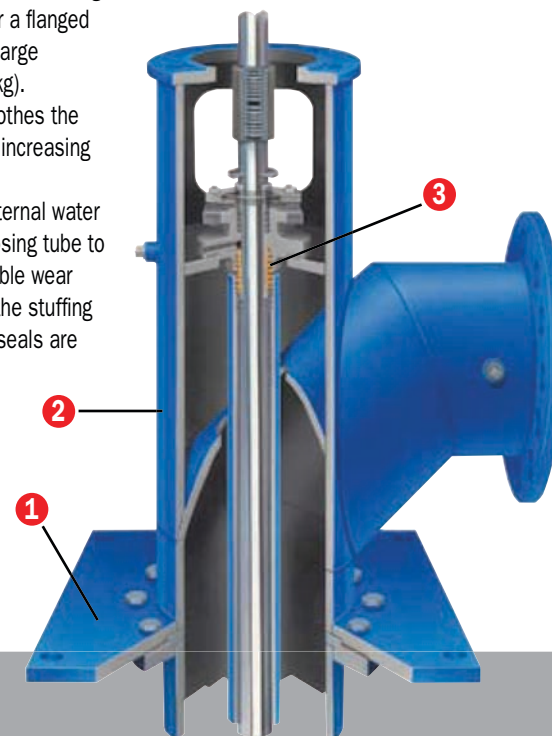
5. **Axial Flow Propellers** have well rounded leading edges, a design feature that keeps stringy materials from accumulating and increases solids-handling abilities.
6. **Mixed Flow Propellers** also feature well rounded edges and a hydrofoil design to help large diameter solids pass. All propellers are dynamically balanced to eliminate vibration.
7. **Bowl Shafts** have large diameters needed to transmit the required drive torque.
8. **Bowl Liners** provide a renewable wear surface and maintain the clearance between the propeller and bowl. Replacement of bowl liners restores worn units to their original condition.



Constructed of rugged cast iron to meet sanitary requirements and support the column, lineshaft, and bowl assemblies, discharge heads can accommodate any drive source. Large openings make it easy to access the stuffing box or mechanical seal, and smooth passageways keep friction low and operation efficient. The integrally-cast discharge flange can be either a 125 lb. (56.699 kg) or 250 lb. (113.4 kg) design.

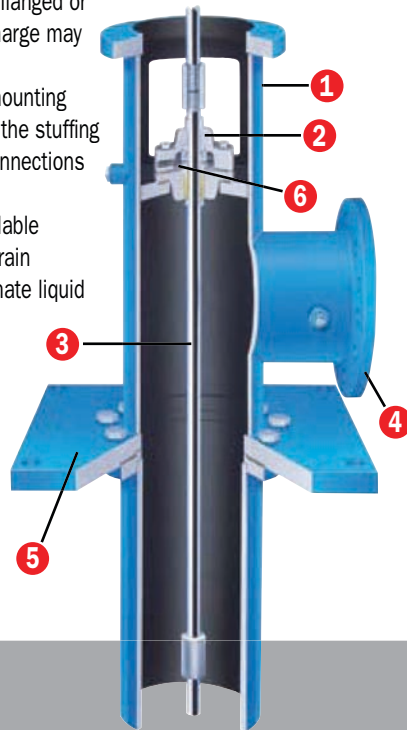
The discharge head is designed to be adaptable to threaded or flanged column. Additional features include the following.

1. **Soleplates** made from cast-iron or steel are used to mount the discharge heads. Once the soleplate is leveled and grouted in place, the pump can be removed for maintenance and then reset without realignment.
2. **Fabricated Discharge Heads** are formed from high quality steel, with the discharge either a flanged or plain-end design. The flanged discharge is available through 300 lb. (136.08 kg). The three-segment elbow design smoothes the fluid flow and reduces friction losses, increasing efficiency.
3. **Water Flush Lubrication** allows an external water source to flow through the shaft enclosing tube to lubricate lineshaft bearings. A renewable wear sleeve protects the shaft throughout the stuffing box area, and packing or mechanical seals are used to seal the shaft.



L-TYPE DISCHARGE HEADS

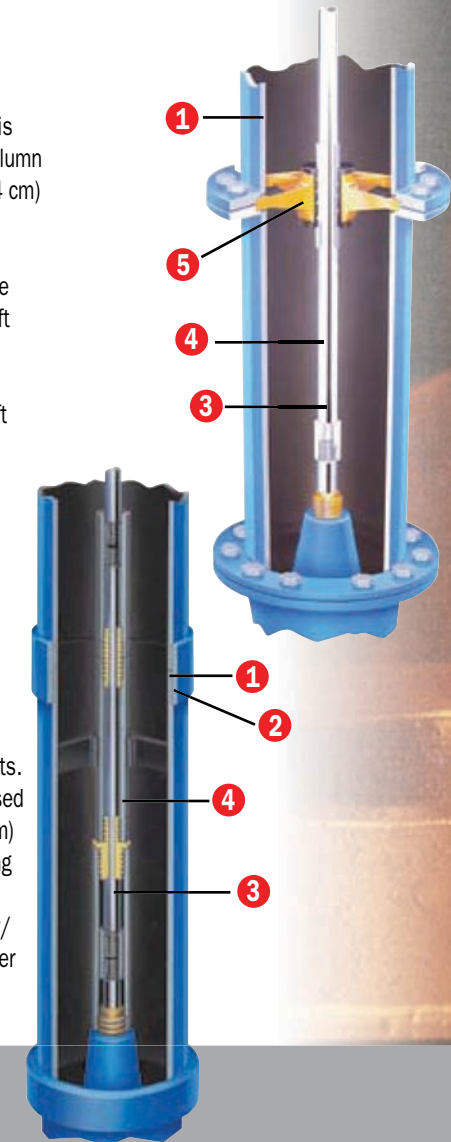
- 1. L-Type Fabricated Discharge Head** is designed to accept the column, shaft, and bowl weight as well as the hydraulic thrust. Formed from high quality steel, heads are gusseted for a rigid base to eliminate vibration and maximize smooth operation.
- 2. Shaft Sealing** can occur using most mechanical 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. Fabricated Steel Pedestal** serves as the mounting base for the driver, and provides access to the stuffing box or mechanical seal area. Air release connections are provided above the base plate.
- 6. Packing Box** is product-lubricated and available through 400 PSI (27.586 Bar). A leakage drain connection is provided in the head to eliminate liquid build up in the packing box.



With an open lineshaft design, the fluid being pumped lubricates the shaft bearings. With an enclosed lineshaft, external water flush, oil, or grease-bearing lubrication can be used. Column connections are ranged for ease of maintenance.

- 1. Threaded Steel Discharge Column** is available in standard sizes through 14" (35.56 cm) diameter. Where greater strength or ease of assembly and disassembly are required, a flanged column pipe is also available in these sizes. A welded flanged column is supplied as standard in column sizes 16" (40.64 cm) and larger.
- 2. Alignment** is maintained on enclosed lineshaft applications by butting the pipe together within the sleeve-type pipe coupling. When an open lineshaft is used, pipe ends are butted on the bearing retainer flange.
- 3. An Enclosing Tube** is used to protect the lineshaft and bearings from the fluid being pumped. Lubricants can be oil, grease or water flush. Note that interchangeable sections in five feet lengths (152.4 cm) have machined ends with bronze connector bearings. Deep set turbines with an enclosed lineshaft utilize a tube stabilizer approximately every 50 feet (15.24 m) of setting.
- 4. The Lineshaft** is precision-ground, high tensile strength steel with an extra strong threaded coupling. Shaft size and bearing spacing are determined by horsepower and thrust requirements.
- 5. Neoprene Spiral Grooved Rubber Bearings** are used in open lineshaft configurations through 14" (35.56 cm) and are held in place by bearing retainers, allowing the shaft and renewable shaft sleeve to rotate. In 16" (40.64 cm) column and larger sizes, a spider/bearing hub is welded in place just below the upper column flange.

COLUMN AND LINESHAFT ASSEMBLIES

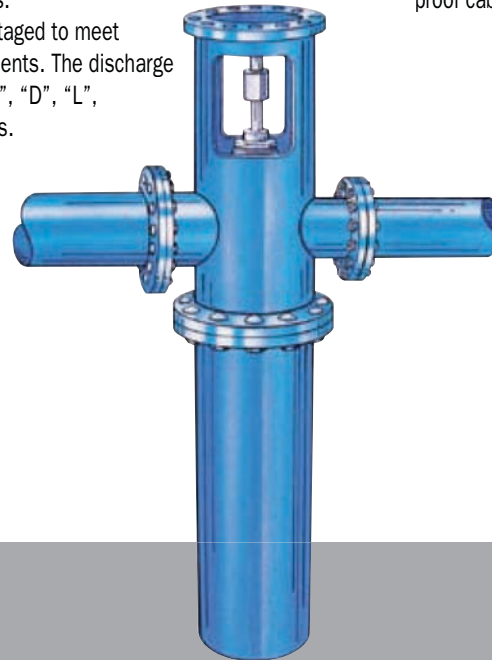


POT PUMPS AND SUBMERSIBLE TURBINES

In situations where the NPSHA is low, in high pressure systems, where suction pressures are variable and/or critical, or where differences in the elevation of suction and discharge piping are needed, vertical turbine pumps can be incorporated with a “pot” or “can”. Pot pumps are frequently used in pipeline (in-line), water booster, boiler feed, condensate, product loading and unloading, and volatile liquids handling applications.

Pot pumps are designed to accommodate different discharge head and pot configurations, and to allow suction and discharge locations above- or below-grade. Featuring a compact design with minimal footprint, pot pumps allow the turbine suction bowl to be submerged for proper NPSHA. Discharge heads are sealed to the pot flange in order 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.



Submersible turbine units perform with the same hydraulics as lineshaft turbines and are used in deep-setting, high head applications where the practical limits of long drive shafts and multiple shaft bearings are exceeded.

Submersible turbine units are also used where dust, fumes, high/low temperatures, etc., might adversely affect driver or discharge head sealing. Submersible turbines are also used when the pump needs to be installed horizontally.

Submersible turbines are driven by a submersible motor coupled directly to the bowl shaft. 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 water-proof cable.



AXIAL FLOW AND MIXED FLOW PERFORMANCE

Axial Flow Performance (A)

Shown are performance curves according to discharge head size, RPMs and single or double-staged bowls.

#	Inches	Meters	RPM	Stages
1.	8"	20 cm	1170 RPM	1-STG
2.	8"	20 cm	1170 RPM	2-STG
3.	10"	25.5 cm	880 RPM	1-STG
4.	8"	20 cm	1770 RPM	1-STG
5.	10"	25.5 cm	1170 RPM	1-STG
6.	8"	20 cm	1770 RPM	2-STG
7.	12"	30.5 cm	880 RPM	1-STG
8.	10"	25.5 cm	1770 RPM	1-STG
9.	12"	30.5 cm	1170 RPM	1-STG
10.	10"	25.5 cm	1770 RPM	2-STG
11.	12"	30.5 cm	1170 RPM	2-STG
12.	12"	30.5 cm	1770 RPM	1-STG
13.	12"	30.5 cm	1770 RPM	2-STG
14.	20"	51 cm	705 RPM	1-STG
15.	20"	51 cm	705 RPM	2-STG
16.	20"	51 cm	880 RPM	1-STG
17.	24"	61 cm	580 RPM	1-STG
18.	20"	51 cm	1170 RPM	1-STG
19.	20"	51 cm	880 RPM	2-STG
20.	24"	61 cm	705 RPM	1-STG
21.	24"	61 cm	880 RPM	1-STG
22.	20"	51 cm	1170 RPM	2-STG
23.	30"	76 cm	500 RPM	1-STG
24.	30"	76 cm	580 RPM	1-STG
25.	30"	76 cm	500 RPM	1-STG
26.	24"	61 cm	880 RPM	2-STG
27.	36"	92 cm	435 RPM	1-STG
28.	30"	76 cm	580 RPM	1-STG
29.	36"	92 cm	580 RPM	1-STG
30.	30"	76 cm	705 RPM	2-STG
31.	36"	92 cm	580 RPM	2-STG
32.	42"	107 cm	390 RPM	1-STG
33.	42"	107 cm	435 RPM	1-STG
34.	42"	107 cm	500 RPM	1-STG
35.	42"	107 cm	435 RPM	2-STG
36.	48"	122 cm	350 RPM	1-STG
37.	48"	122 cm	390 RPM	1-STG
38.	48"	122 cm	435 RPM	1-STG
39.	42"	107 cm	500 RPM	2-STG
40.	48"	122 cm	435 RPM	2-STG
41.	54"	137 cm	290 RPM	1-STG
42.	54"	137 cm	320 RPM	1-STG
43.	54"	137 cm	350 RPM	1-STG
44.	60"	152 cm	270 RPM	1-STG
45.	60"	152 cm	320 RPM	1-STG
46.	54"	137 cm	320 RPM	1-STG
47.	60"	152 cm	320 RPM	2-STG
48.	63"	160 cm	270 RPM	1-STG
49.	63"	160 cm	320 RPM	1-STG

#	Inches	Meters	RPM	Stages
50.	63"	160 cm	320 RPM	2-STG
51.	72"	183 cm	235 RPM	1-STG
52.	72"	183 cm	270 RPM	1-STG
53.	72"	183 cm	270 RPM	2-STG
54.	84"	213 cm		1-STG*
55.	84"	213 cm		1-STG*
56.	104"	264 cm		1-STG*
57.	104"	264 cm		2-STG*
58.	110"	279 cm		1-STG*
59.	110"	279 cm		2-STG*
60.	116"	295 cm		1-STG*
61.	116"	295 cm		2-STG*
62.	132"	335 cm		
	& 144"	& 366 cm		1-STG
63.	132"	335 cm		
	& 144"	& 366 cm		2-STG
64.	152"	386 cm		1-STG*
65.	152"	386 cm		2-STG*

*Various RPM s

Mixed Flow Performance (B)

Shown are performance curves according to discharge head size, RPMs and single or double-staged bowls.

#	Inches	Meters	RPM	Stages
1.	10"	25.5 cm	880 RPM	1-STG
2.	10"	25.5 cm	1170 RPM	1-STG
3.	10"	25.5 cm	880 RPM	2-STG
4.	10"	25.5 cm	1170 RPM	2-STG
5.	10"	25.5 cm	1770 RPM	1-STG
6.	12"	30.5 cm	880 RPM	1-STG
7.	10"	25.5 cm	1170 RPM	2-STG
8.	12"	30.5 cm	1170 RPM	2-STG
9.	12"	30.5 cm	1170 RPM	1-STG
10.	14"	35.5 cm	705 RPM	1-STG
11.	12"	30.5 cm	1770 RPM	1-STG
12.	14"	35.5 cm	880 RPM	1-STG
13.	12"	30.5 cm	1170 RPM	2-STG
14.	14"	35.5 cm	1170 RPM	2-STG
15.	16"	40.5 cm	880 RPM	2-STG
16.	14"	35.5 cm	1170 RPM	1-STG
17.	16"	40.5 cm	880 RPM	1-STG
18.	16"	40.5 cm	705 RPM	1-STG
19.	16"	40.5 cm	1170 RPM	1-STG
20.	20"	51 cm	880 RPM	1-STG
21.	20"	51 cm	705 RPM	1-STG
22.	20"	51 cm	880 RPM	1-STG
23.	16"	40.5 cm	1170 RPM	2-STG
24.	20"	51 cm	880 RPM	2-STG
25.	20"	51 cm	705 RPM	2-STG
26.	24"	61 cm	580 RPM	2-STG
27.	24"	61 cm	705 RPM	1-STG
28.	24"	61 cm	580 RPM	1-STG
29.	30"	76 cm	500 RPM	1-STG
30.	24"	61 cm	705 RPM	2-STG
31.	30"	76 cm	500 RPM	2-STG
32.	30"	76 cm	580 RPM	1-STG

#	Inches	Meters	RPM	Stages
33.	30"	76 cm	435 RPM	1-STG
34.	30"	76 cm	580 RPM	2-STG
35.	30"	76 cm	500 RPM	2-STG
36.	30"	76 cm	580 RPM	1-STG
37.	30"	76 cm	500 RPM	1-STG
38.	36"	92 cm	390 RPM	1-STG
39.	36"	92 cm	500 RPM	1-STG
40.	36"	92 cm	435 RPM	1-STG
41.	30"	76 cm	580 RPM	2-STG
42.	42"	107 cm	435 RPM	1-STG
43.	42"	107 cm	390 RPM	1-STG
44.	42"	107 cm	350 RPM	1-STG
45.	36"	92 cm	500 RPM	2-STG
46.	48"	122 cm	350 RPM	1-STG
47.	48"	122 cm	320 RPM	1-STG
48.	42"	107 cm	435 RPM	2-STG
49.	60"	152 cm	290 RPM	1-STG
50.	60"	152 cm	250 RPM	1-STG
51.	48"	122 cm	350 RPM	2-STG
52.	72"	183 cm	250 RPM	1-STG
53.	72"	183 cm	220 RPM	1-STG
54.	60"	152 cm	290 RPM	2-STG
55.	72"	183 cm	250 RPM	2-STG

TURBINE PERFORMANCE

Turbine Performance- High RPM (A)

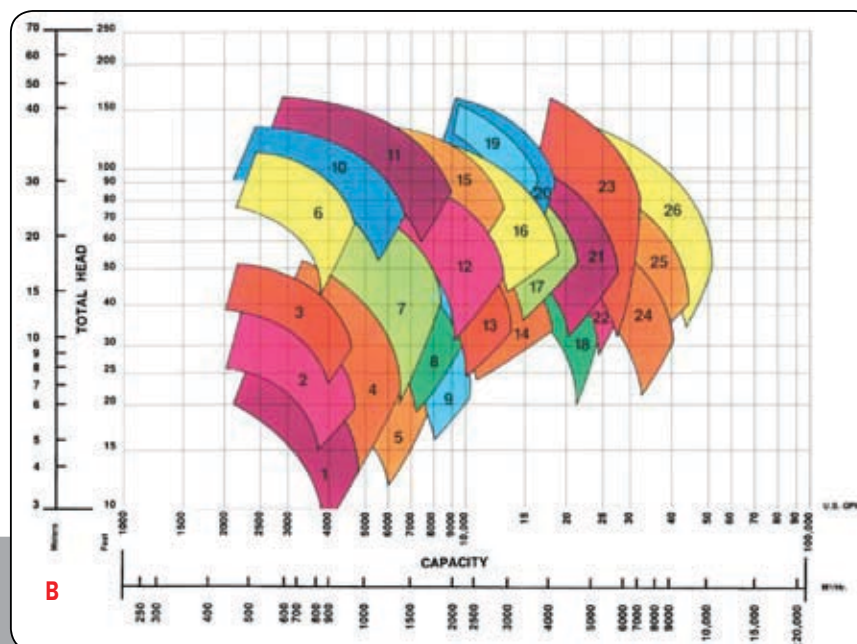
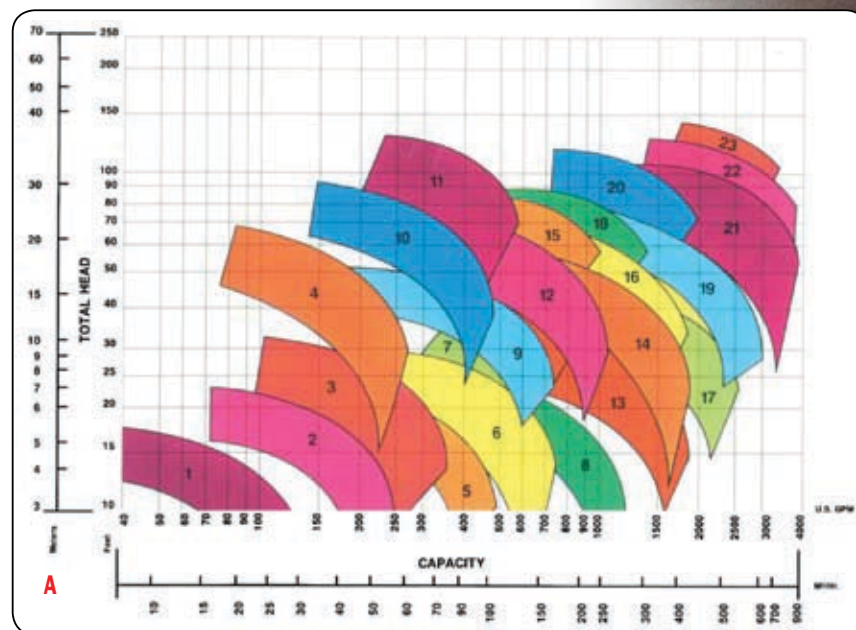
Shown are performance curves according to the bowl sizes and types in the Fairbanks Morse Vertical Turbine line ranging from 1200-3600 RPM.

#	Bowl Sizes/ Type	RPM
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

Turbine Performance- Low RPM (B)

Shown are performance curves according to the bowl sizes and types in the Fairbanks Morse Vertical Turbine line ranging from 440-1800 RPM.

#	Bowl Sizes/ Type	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



THE COMMITMENT OF FAIRBANKS MORSE

Our distinctive products, market leadership, excellent customer service, and longevity in the industry are all a result of the quality and dedication of our personnel.

Our pumps are machined, built, and tested by highly skilled shop personnel. Working as a team, our people continually explore new ways to better serve our customers.

Product quality, dependability, and innovation are all part of the Fairbanks Morse commitment to excellence.

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