# Contents

# I . General Description

1. Application

The mixed—flow pump is one of the horizontal, single stage, single suction overhung type volute pump. The head is low and the capacity is large. The pump is suitable for agricultural irrigation and drainage or industrial water supply and drainage.

2. Features

The pump has many features such as small bidy, light weight, simeple construction, simple operation, ease of maintenance and repair, high effciency.

3. Product introduction

HB series include 6HB—35, 8HB—35, 10HBC—30, 12HBC—30, 14HBC—40, 16HBC—40, 20HBC—40, 26HBC—40, HW series includ 150HW—5, 200HW—4, 200HW—8, 250HW—4, 250HW—7, 300HW—4, 300HW—7, 350HW—8, 400HW—7, 500HW—6, 650HW—7, Application range:

Head: 4——12m

Capacity: 180——3550m³/h

Explanations of model:

To take 12HBC—40 for example.

12——pump inlet diameter in mm has been decreased bytwety—five times and rounded.

(The pump inlet diameter is 300 mm)H——mixed—flow

B—single stage, single suction overhung type volute pump

C—three improvement

40——specific speed of the pump has been decreased by fourth times and rounded.

(The specific speed is 400)

To take 250HW—7 for example,

250——the pump inlet diameter is 250mm.

H—mixed—flow

W—volute pump

7——head is 7m.

4. Driving device

Driving device must be determined according as local power.

Direct coupling or to drive the pump through belting or gear box may be used. Usually the motive power is an electric motor or a diesel engine. when order the goods, you must determine that power and speed of motive power machine and drive manner of pump, so that determine the size of coupling or pulley.

5. Direction of rotation

Direction of rotation of pump must be in conformity with direction that arrow has indicate in bearing case, as observed from the suction side the rotation of the impeller is counter—clockwise.

## Ⅰ. Construction and Action

1. The mixed—flow pump consists of pump body, pump shroud, impeller, shaft and bearing case, packing box etc.

2. The pump shroud is connected separately with pump casing and inlet pipe. There is a certain gap between the pump shroud and the impeller. If this gap is smaller, it will easily occur rubbing action. Conversely, if this gap is greater, there will too much flow of liquid from the high pressure side to the low pressure side, so that the efficient of the pump is decreased. The gap may be adjusted by the number of gaskets.

3. The shaft sealing device is composed of stuffing box, seal cage, gland and oil—filled asbestos packing. The action are: to prevent air from leaking imto the pump before starting and much more water flow out along the shaft.

4. The pump shaft is supported by two—end ball bearings in bearing case. The lubricating oil poured into the bearing case, to ensure kept normal state, and the oil level should lie between the two scale on oil level rod.

5. The groove on shaft sleeve, the rubber ring and the oil ring are used for prevent water from flowing into the bearing case so as to protect the ball bearing from abnormal wear.

6. The construction is shown in Fig. 1 and Fig. 2.

7. The impeller nut of the pump are made of iron or fabric filled plastics. These materials have enough strength for use, but must be noted that is not too loose to the spanner of the impeller nut. otherwise the impeller nut will be broken easily during operation.

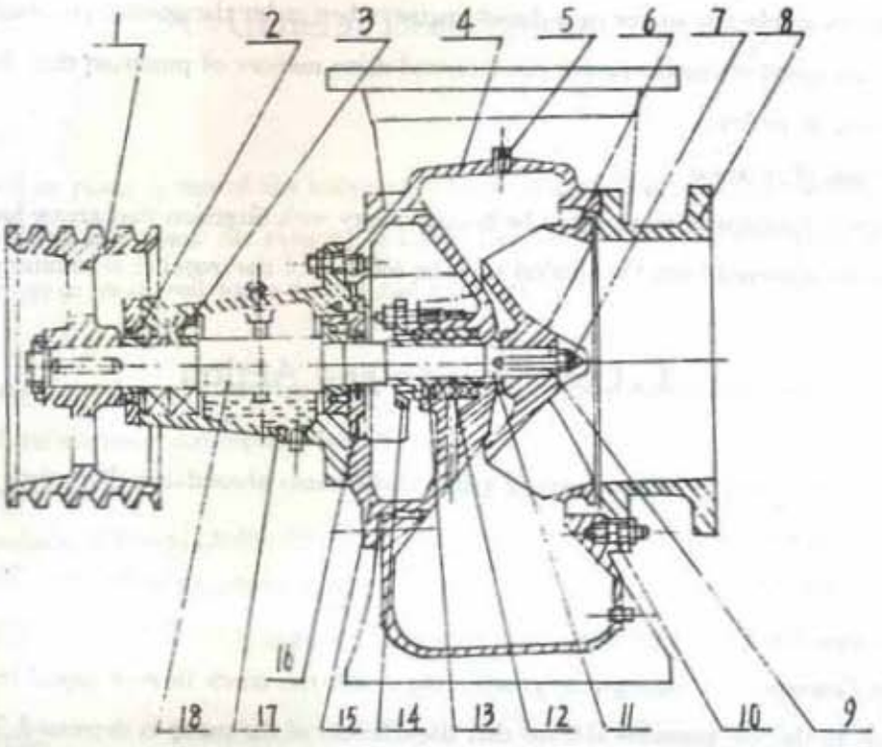



Figure 1 Vertical outlet type

| | | | | | |
|---|---|---|---|---|---|
| 1 | Pulley | 7 | Impeller nut | 13 | Packing |
| 2 | Thrust sleeve | 8 | Impeller shroud | 14 | Gland |
| 3 | Bearing | 9 | Washer | 15 | Packing seat |
| 4 | Pump body | 10 | Paper gasket | 16 | Bearing end cover |
| 5 | Screwed plug | 11 | Neck sleeve | 17 | Bearing case |
| 6 | Impeller | 12 | Packing ring | 18 | Shaft |

| Pump type | Bearing type | Packing Specification | Pump type | Bearing type | Packing Specification |
|---|---|---|---|---|---|
| 6HB—35 | 306 | 10×10×157 | 12HBC—40 | 311 | 13×13×229 |
| 8HB—35 | 308 | 10×10×189 | 12HBC—50T | 311 | 12×12×226 |
| 10HBC—$\frac{30}{40}$ | 311 | 13×13×229 | 14HBC—40 | 311 | 13×13×229 |

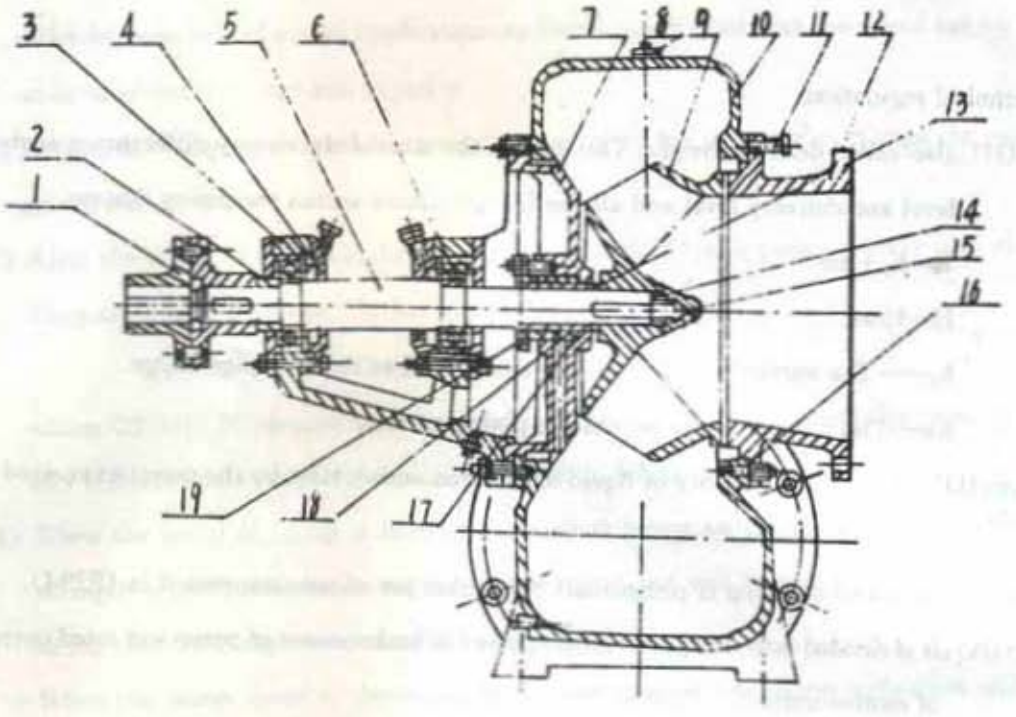



Figure 2 Horizontal outlet type

| | | | | | |
|---|---|---|---|---|---|
| 1 | Coupling | 8 | Screwed plug | 15 | Impeller nut |
| 2 | Thrust sleeve | 9 | Impeller | 16 | Paper gasket |
| 3 | Bearing case | 10 | Pump body | 17 | Packing |
| 4 | Bearing end cover | 11 | Screw | 18 | Packing ring |
| 5 | Shaft | 12 | Pump shroud | 19 | Gland |
| 6 | Bearing | 13 | Necksleeve | | |
| 7 | Tail cover | 14 | Washer | | |

| Pump type | Bearing type | Packing Specification | Pump type | Bearing type | Packing Specification |
|---|---|---|---|---|---|
| 14HBC—40 | 311 | 13×13×220 | 20HBC—40 | 314 | 15×15×298 |
| 16HBC—40 | 312 | 13×13×261 | 26HB—40 | 46322 | 20×20×420 |

# Ⅲ. Main Technical Characteristics

1. Main technical regulations

(1) Head(H): also called delivery height. This means the sum of the energy differencein suction level and delivery level and all the friction losses within the piping system.

$H=h_2+hw$

H—Head

$h_2$——The vertical distance from suction level to delivery pige centre.

hw—The friction losses within the piping system.

(2) Capacity(Q): This means quantity of liquid discharged in unit time by the pump, expressed in (liter/sec)of($m^3$/h).

(3) Speed(n): The speed of pump is pump shaft revolution per minute, expressed in (RPM).

(4) Power(N): It is divided into two power, shaft power or brake power of pump and rated output of motive unit.

a. shaft power N: the power needed by the pump for running expressed in H. P. or kw.

b. rated output of motive unit $N_R$: there should be a generous margin between $N_H$ and $N_R$ to prevent the motive unit overlead.

(5) Efficiency($\eta$): One of the chief characteristics is expressed in perce—ntage(%).

$$=\frac{HQ\gamma}{102N}\cdot 100\%$$

H……Head(M)

Q……Capacity(L/Sec)

$\gamma$……Specific gravity of pumping liquid($kg/m^3$)

N……Shaft power (kw)

(6) Allowable suction head(Hg): This one of the chief characteristics

This means the sum of vertical distance between pump axis and suction level and the losses within the inlet piping system, also is the most height of installation of the pump, it is expressed in meter(M).

2. The performance curves are shown balow.

3. Veriable speeds

(1) The mixed—flow pump may be used in various districts. Because the speed of the pump is different from one of actual application, so then it is adopted that the speed can be altered so as to adjust the head and capacity.

(2) Method to change the speed: to change the pulley of the pump or to change the gears of a gear drive.

(3) After the speed is changed, the capacity (Q), head (H), and power (N) are also changed. They are linked by these relation ships:

$$Q1=Q\frac{n_1}{n} \qquad H1=H(\frac{n_1}{n})^2 \qquad N1=N(\frac{n_1}{n})^3$$

where Q1, H1, N1 denote capacity, head and power respectively atter the speed is varied, and Q, H, N denote capacity, head and power at defined pump speed.

(4) When the speed of pump is increased, the shaft power is increased by cubic power. The strength of shaft will not be suffient for running, and will be probably broken. Therefore to increase the pump speed should be very carefully.

(5) When the pump speed is decreased by a great amount, the pump utilization will be decreased. To ensure efficiency of pump, it should be avoided as possible to run the pump at a too low speed.

# Ⅳ. Installation

There are three types for the installtion of HB type pumps: underground, semiunderground, over-ground. The semi-underground typs is better. The bearings of pumps of underground installation wear out frequently, and this does not exist in the pumps of semi-underground installation. For maintenance, the semi-under-ground installation takes away the difficulties which exist in underground installation. For suction piping, the semi-underground installation decreas the loss which exists in over-ground installation because of high suction head and long suction pipe.

1. Requirements:

(1) Pump position: High water level should not exceed the lower part of bearing; low water level should be consiered in such a way that the total suction head including the loss in inlet piping should not excee the allowable suction head.

(2) The pump set should be located around water source as near as possible so that the inlet pipe is short and suction loss is less.

(3) The whole piping system should be as straight and short as possible.

When the pump is installed on land, a 90° or 33° elbow is used in inlet piping system, the toundation is inclined so that no elbow is reguiredin outlet piping system. For special reguiremint, the user may suggest extra elbows betore the contract is completed.

2. Attentron

(1) As to belt drive, the belt pulleys of both driver and pump should be aligned, and a belt guard is needed for satety.

(2) A straight pipe is required between the pump inlet and elbow so as to assure that the velocity of water flowing into the pump will be uniform.

(3) Between the flanges of pipes and pipe fitings there should be gaskets, of asbestos or rubber in order to prevent water and air from leaking.

(4) The inlet pipe should be submeiged into the inlet water pool.

(5) The outlet pipe should be submerged into the outlet water pool and the pipe end should be near the water surface so as to decrease head lose.

(6) The suction opening of inlet pipe should be netted with steel wire in order to prevent

aquatic plants and other objects from entering into the impeller.

(7) When the pump is installed on ship, pay attention to the fact: when water is delivered, one end of ship is lowered or the ship is tilted and the shaft of pump should be kept horizontal to prevent ball bearing at one end of bearing box from being damaged for the lack of ludricating oil.

# V. Use and Maintenance

1. Testing

After installation, the pump must be tested. The purpose of testing includes: (a). to make the pump running smoothly, (b). to find out the troubles and to remedy, (c). to check whether the rotation of pump is right.

2. Preparations before starting—up

(1) Inspect the tightness of screws and nuts.

(2) Inspect the belt whether it is too loose or too tight, and also inspect the safeguard of the belt.

(3) Inspect the suction pipes and the delivery pipes whether they are leakage.

(4) Inspect whether there is enough lubricating oil and bearing case screwbolts are tightneess.

(5) The gland—nusts should only be pulled up by tingertight. But it can not too loose so as to prevent air from leaking into the pump.

(6) When the pump is connected directly with the motor by flexible coupling, it is needed that inspect whether the axis of the pump and the axis of motor lie on the same straight line, so as to avoid vibration in running.

(7) To turn shaft of the pump by hand, to make sure that must be free. The clearance of sealing should be kept down to ist limiting valuebut no rubbing action is allowed.

3. Starting the pump

(1) Close the delivery valve.

(2) Turn the priming funnel and pour water into the priming funnel until excess water is seen to come out. when evacuating pump is used, the evacuating valve is opened, set the exhausting apparatus to work. When the pump casting is full of water, shut the evacuating, stop the evacuating pump.

(3) Start the motive unit. Note whether the direction of rotation of the pump is right.

(4) When the pump is running under normal speed, gradually open the delivery valve, then regulate the packing. If running of pump and bearing temperature are normal and vibra-

tion is negligible, keep the pump running.

4. Use and maintenance

(1) Inspect the oil level in bearing case. At a time, note whether there is some water in bearing case. If any must adopt remedies.

(2) Inspect the bearing temperature rise, which is limited by 65 C (too hot by feeling), and is roughly 35 C higher than room temperature. If the bearing temperature is too high, stop the pump, find out the cause and remedy it.

(3) *Note frequently whether all bolts, screws and nuts are loosened by vibration in running.* Tighten them as soon as they are loosened.

(4) Note whether the shaft power incerases or decreases suddenly, and the head and capacity decrease suddenly. If there happen, stop the pump and find out the cause.

(5) The regulation of packing must be adeguate, and liquid must be kept flowing out from the gland drop by drop. If the packing is too tight, the shaft will be overheated and brake power is increased; if the packing is too loose, leakage will be too much and efficiency decreases, even air will probably penetrate into the pump.

(6) Note whether there is unexpected noise within the pump during running. If this happens, stop and inspect the pump. When there is rubbing action between pump shroud and impeller, increase paper gaskets (the required clearance 0. 3——0. 8mm, small elearance for small pump)

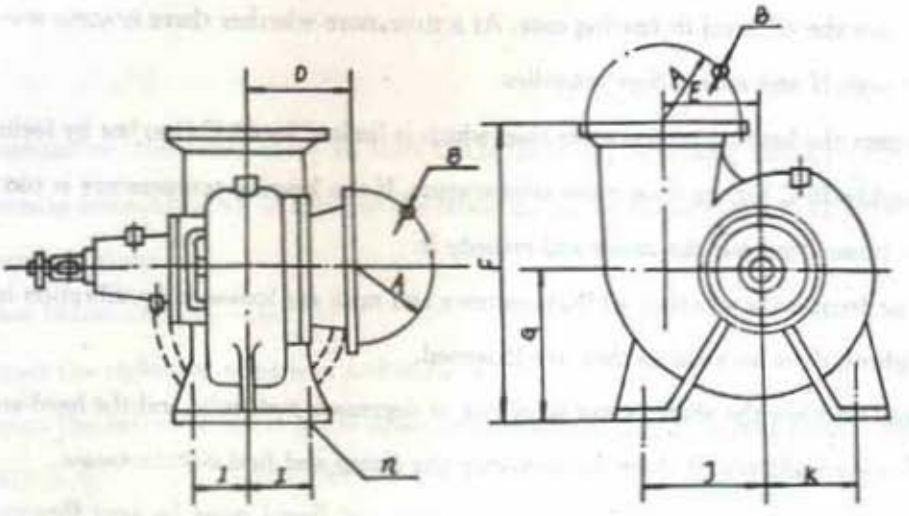
(7) Inspect whether there is leakage in suction pipes.

(8) In winter, after the pump is stopped, water must be drained off from the pump and pipes so as to prevent the pump from being frozen to crack.

(9) At first, replace the lubricating oil or grease after the pump has been used for 100 hours, afterwards replace the lubricating oil or grease for every 500 hours.

(10) After the pump has been used for 1000 hours, dismount and inspect the quick—wearing parts. When the pump will not be used for a long peried, dismount all the moving parts, dry and oil them with anticorrosive oiland then well prsesrve them.

(11) Reter to para.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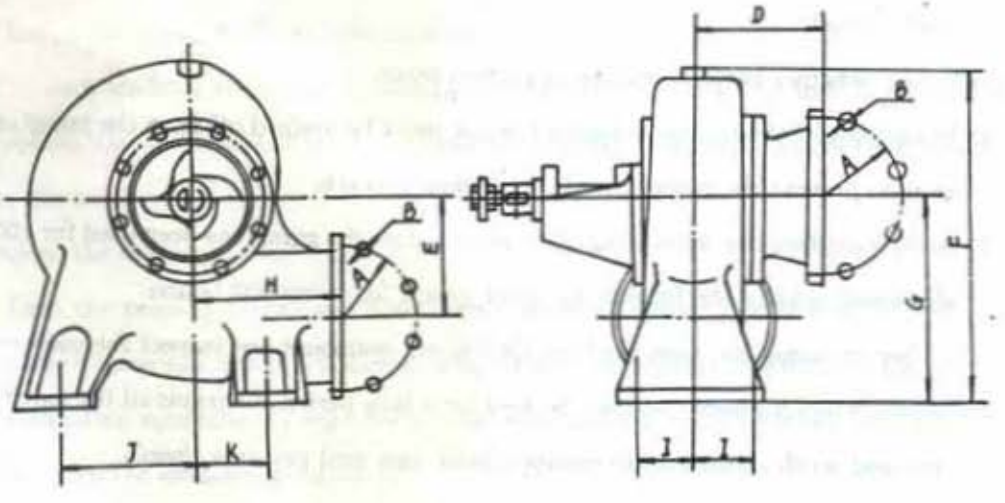
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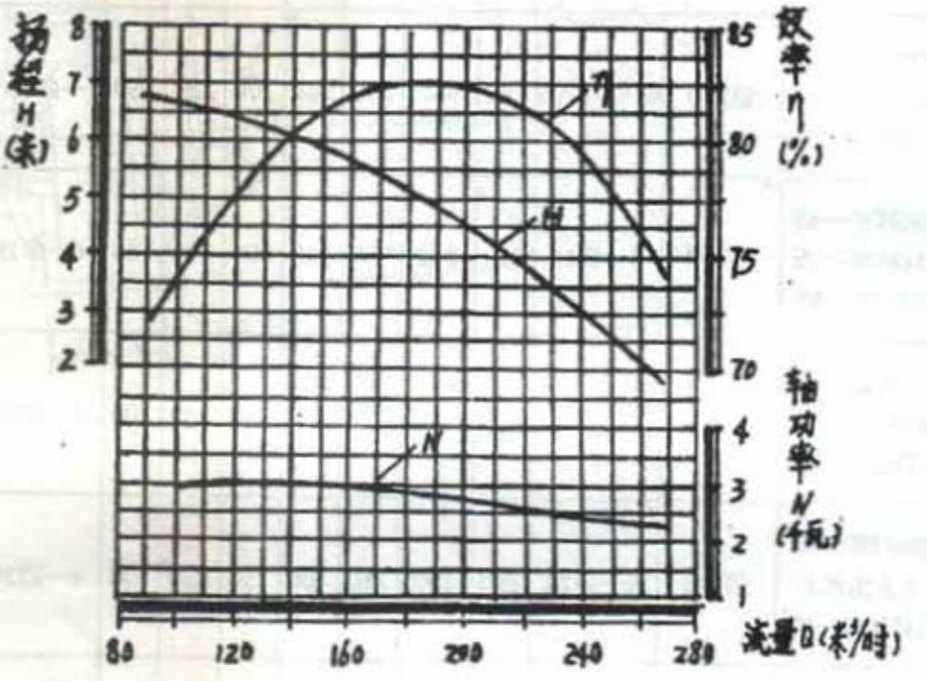
| Model | A | B | D | E | F | G | I | J | K | n | H |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100HW—8S | Ø160 | 4—Ø17.5 | | 99 | 280 | 140 | 45 | 110 | 80 | 4—Ø14.5 | / |
| 150HW—5S<br>6HB—35 | Ø210 | 6—Ø13.5 | 150 | 148 | 400 | 195 | 78 | 154 | 92 | 4—Ø18.5 | / |
| 200HW—4S<br>200H—8S<br>8HB—35 | Ø270 | 6—Ø17.5 | 188 | 193.5 | 500 | 265 | 100 | 220 | 150 | 4—Ø18.5 | / |
| 250HW—4S<br>250HW—7S<br>10HBC—30 | Ø320 | 8—Ø18 | 250 | 232 | 583 | 295 | 123 | 262 | 164 | 4—Ø18 | / |
| 300HW—4S<br>300HW—7S<br>12HBC—40 | Ø380 | 8—Ø18 | 236 | 282 | 710 | 360 | 150 | 320 | 200 | 4—Ø23 | / |
| 350HW—8S<br>(上出水)<br>14HBC—40 | Ø445 | 8—Ø23 | 290 | 290 | 780 | 400 | 150 | 320 | 200 | 4—Ø23 | / |
| 350HW—8S<br>(水平出水)<br>14HBC—40 | Ø445 | 8—Ø23 | 290 | 290 | 903 | 545 | 150 | 240 | 200 | 4—Ø23 | 380 |
| 400HW—7S<br>16HBC—40 | Ø500 | 8—Ø23 | 305 | 370 | 1082 | 655 | 190 | 320 | 230 | 4—Ø30 | 450 |
| 500HW—6S<br>20HBC—40 | Ø600 | 10—Ø23 | 332 | 400 | 1226 | 730 | 195 | 425 | 335 | 4—Ø30 | 565 |
| 650HW—7S<br>26HBC—40 | Ø770 | 12—Ø27 | 480 | 430 | 1670 | 1000 | 290 | 550 | 430 | 4—Ø34 | 735 |

6HB—35Mixed—flow pump Performance curves

150HW—5S 型混流泵性能曲线图

(n=1450 转/分)



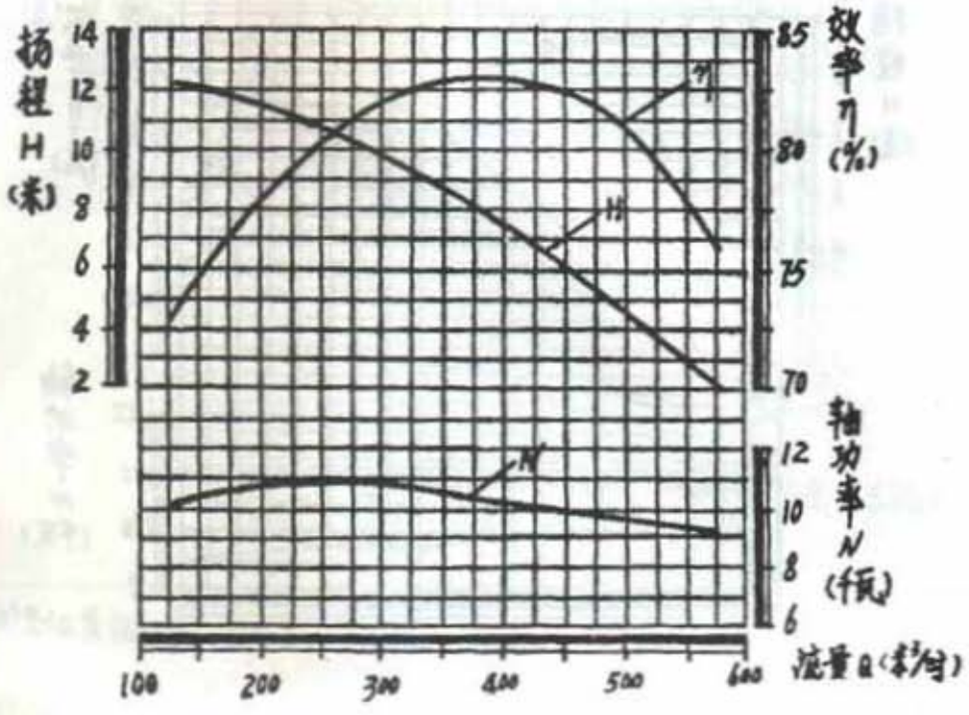

| Capacity Q | | Head H (M) | Speed n (RPM) | Power N | | Effciency η (%) | Allowable suction head Hs (M) | Inletant outlet diameter (mm) | Impeller diameter (mm) | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| ($m^3$/h) | (L/Sec) | | | Brake power (HP) | Motive power (HP/KW) | | | | | |
| 137 | 38 | 6.1 | | 4.3 | | 75 | | | | |
| 180 | 50 | 5.0 | 1450 | 4.0 | 5/4 | 80 | 3.5 | 150 | 190 | 65 |
| 216 | 60 | 3.7 | | 4.0 | | 78 | | | | |

Notice: Weight means pump weight, elbows, belt pulley or coupling, bottom valve are not included.

8HB—35Mixed—flow pump Performance curves

200HW—8S 型混流泵性能曲线图

(n=1450 转/分)



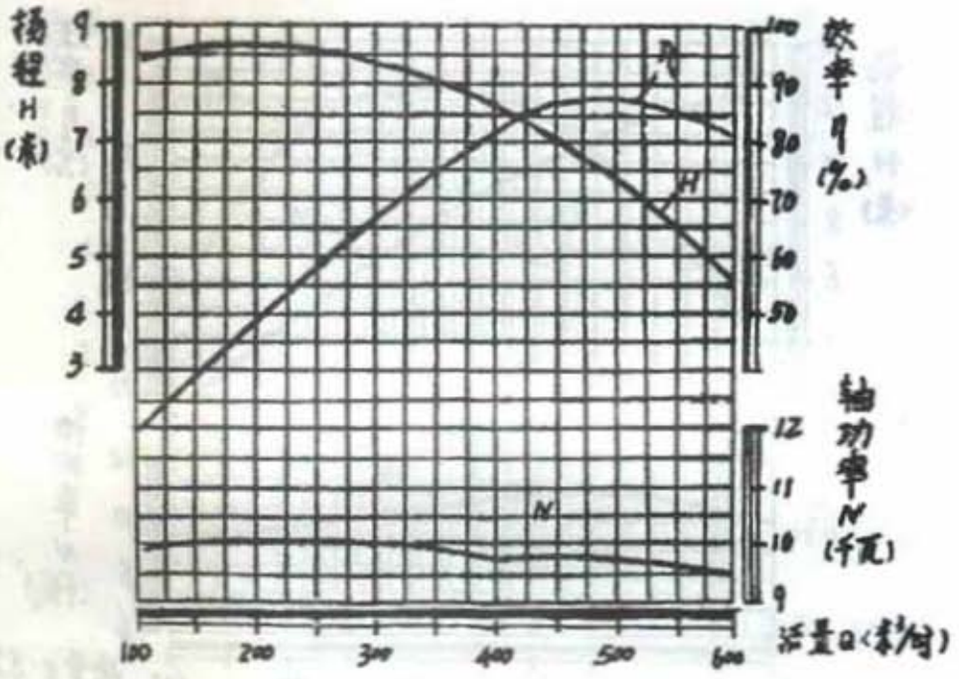

| Capacity Q | | Head H (M) | Speed n (RPM) | Power N | | Effciency η (%) | Allowable suction head Hs (M) | Inletant outlet diameter (mm) | Impeller diameter (mm) | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| ($m^3$/h) | (L/Sec) | | | Brake power (HP) | Motive power (HP/KW) | | | | | |
| 270 | 75 | 9.6 | | 13.5 | | 79 | | | | |
| 360 | 100 | 8.0 | 1450 | 13.4 | 15/11 | 82 | 5 | 200 | 238 | 110 |
| 432 | 120 | 6.0 | | 13.0 | | 77 | | | | |

Notice: Weight means pump weight, elbows, belt pulley or coupling, bottom valve are not included.

10HBC—30Mixed—flow pump Performance curves

250HW—7S 型混流泵性能曲线图

(n=980 转/分)



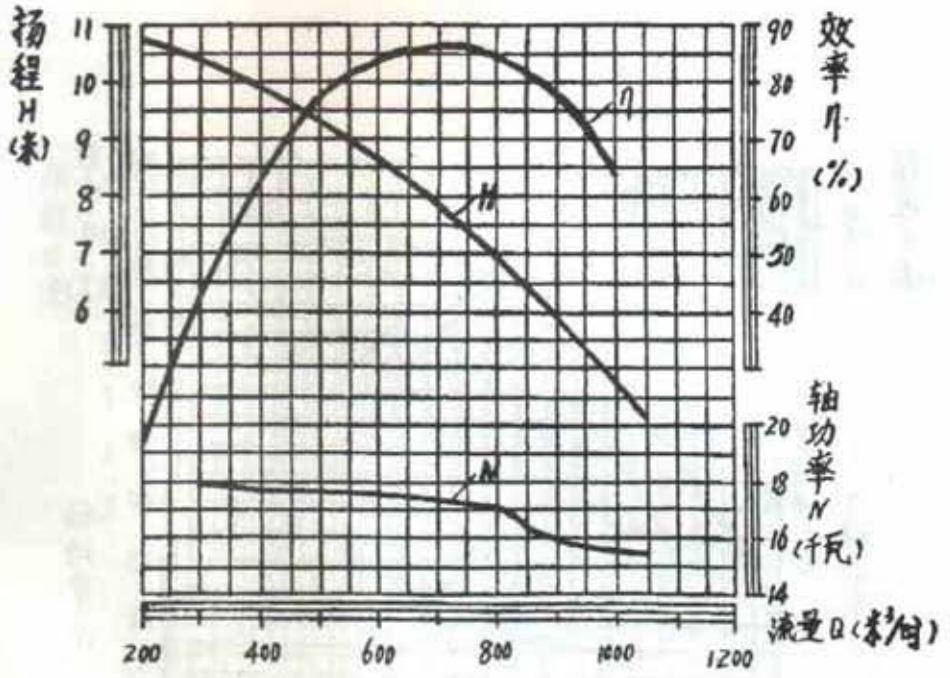

| Capacity Q | | Head H (M) | Speed n (RPM) | Power N | | Effciency η (%) | Allowable suction head Hs (M) | Inletant outlet-diameter (mm) | Impeller diameter (mm) | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| ($m^3$/h) | (L/Sec) | | | Brake power (HP) | Motive power (HP/KW) | | | | | |
| 400 | 111 | 8.0 | | 14.6 | | 81.0 | | | | |
| 450 | 125 | 7.0 | 980 | 14.0 | 20/14 | 83.5 | 4.5 | 250 | 304 | 160 |
| 500 | 139 | 6.3 | | 14.8 | | 79.0 | | | | |

Notice: Weight means pump weight, elbows, belt pulley or coupling, bottom valve are not included.

12HBC—40Mixed—flow pump Performance curves

300HW—7S 型混流泵性能曲线图

(n=980 转/分)



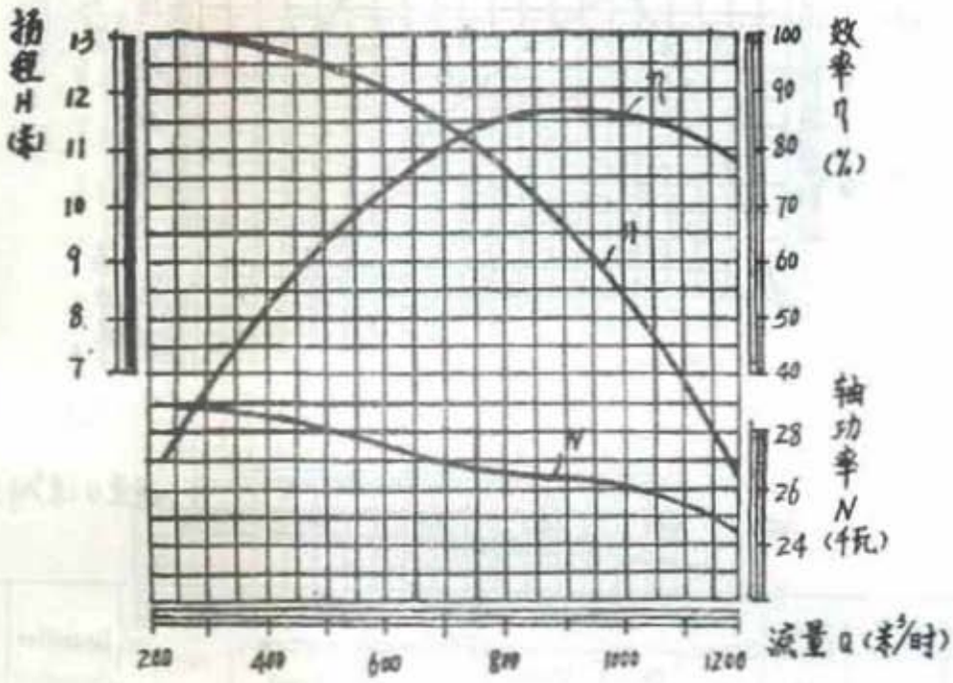

| Capacity Q | | Head H (M) | Speed n (RPM) | Power N | | Effciency η (%) | Allowable suction head Hs (M) | Inletant outlet diameter (mm) | Impeller diameter (mm) | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| ($m^3$/h) | (L/Sec) | | | Brake power (HP) | Motive power (HP/KW) | | | | | |
| 507 | 141 | 4.4 | | 10.1 | | 82 | | | | |
| 581 | 161 | 3.9 | 730 | 10.0 | 12/10 | 84 | 5 | | | |
| 678 | 188 | 2.8 | | 9.0 | | 78 | | | | |
| 680 | 189 | 8.0 | | 24.6 | | 82 | | | | |
| 780 | 217 | 7.0 | 980 | 24.0 | 30/22 | 84 | 6 | 300 | 341 | 200 |
| 910 | 253 | 5.0 | | 21.6 | | 78 | | | | |
| 902 | 251 | 14.1 | | 57.5 | | 82 | | | | |
| 1035 | 288 | 12.3 | 1300 | 56.2 | 80/55 | 84 | 4 | | | |
| 1207 | 335 | 8.8 | | 50.4 | | 78 | | | | |

Notice: Weight means pump weight, elbows, belt pulley or coupling, bottom valve are not included.

14HBC—40Mixed—flow pump Performance curves

350HW—8S 型混流泵性能曲线图

(n=980 转/分)



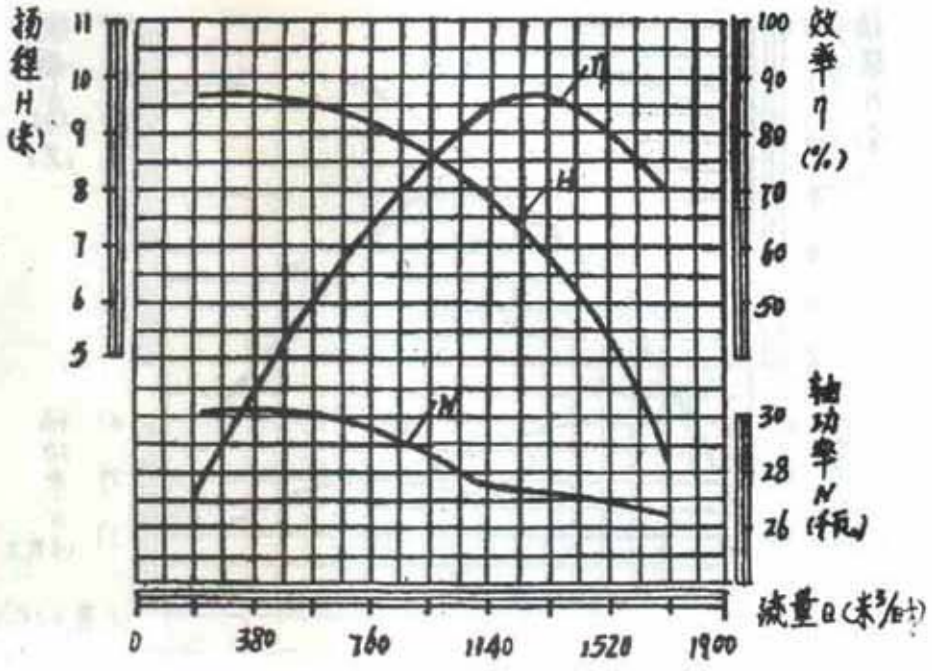

| Capacity Q | | Head H (M) | Speed n (RPM) | Power N | | Effciency η (%) | Allowable suction head Hs (M) | Inletant outlet diameter (mm) | Impelier diameter (mm) | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| ($m^3$/h) | (L/Sec) | | | Brake power (HP) | Motive power (HP/KW) | | | | | |
| 900 | 250 | 9.4 | | 36.9 | | 85.0 | | | | |
| 1000 | 278 | 8.0 | 980 | 34.7 | 40/30 | 85.5 | 5 | 350 | 376 | 330 |
| 1100 | 306 | 6.7 | | 33.5 | | 81.5 | | | | |

Notice: Weight means pump weight, elbows, belt pulley or coupling, bottom valve are not included.

16HBC—40Mixed—flow pump Performance curves

400HW—7S 型混流泵性能曲线图

(n=730 转/分)



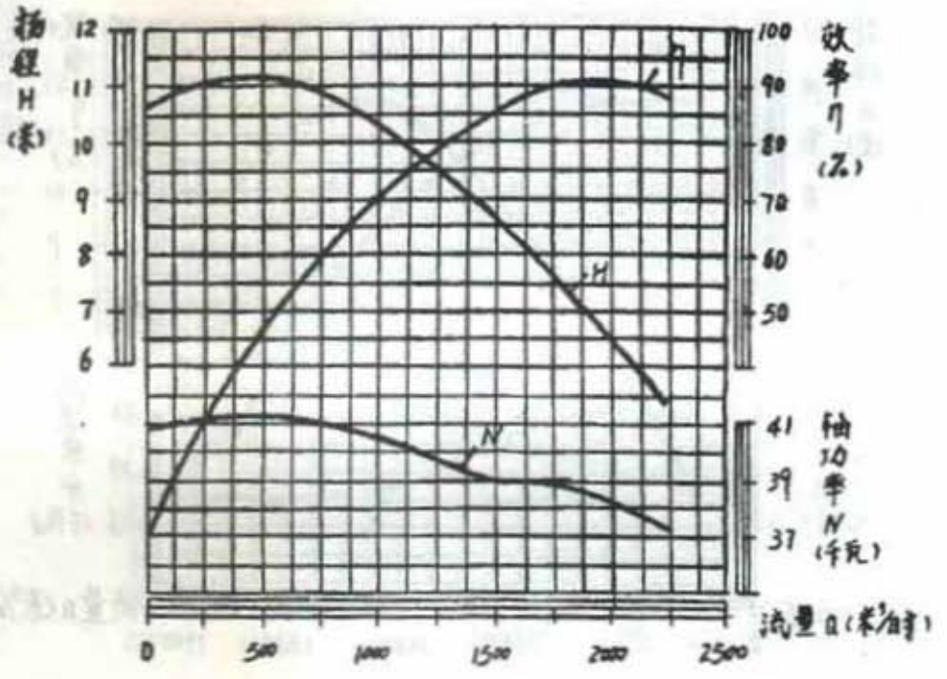

| Capacity Q | | Head H (M) | Speed n (RPM) | Power N | | Effciency η (%) | Allowable suction head Hs (M) | Inletant outlet diameter (mm) | Impeller diameter (mm) | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| ($m^3$/h) | (L/Sec) | | | Brake power (HP) | Motive power (HP/KW) | | | | | |
| 1080 | 300 | 7.6 | | 36.2 | | 84 | | | | |
| 1260 | 350 | 7.0 | 730 | 38.2 | 50/40 | 85.5 | 5 | 400 | 465 | 550 |
| 1368 | 380 | 6.4 | | 40.5 | | 80.0 | | | | |

Notice: Weight means pump weight, elbows, belt pulley or coupling, bottom valve are not included.

20HBC—40Mixed—flow pump Performance curves

500HW—6S 型混流泵性能曲线图

(n=580 转/分)



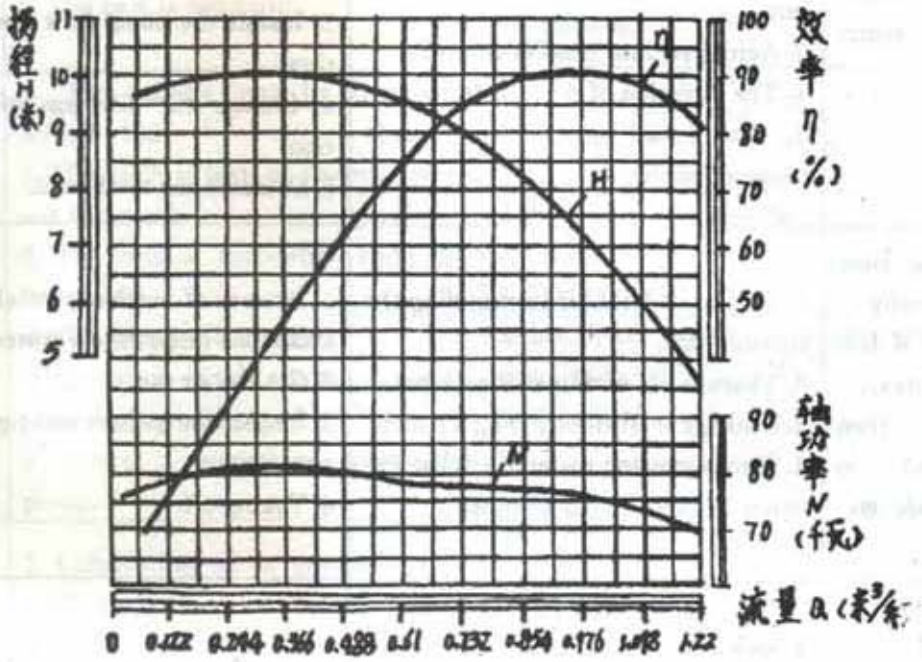

| Capacity Q | | Head H (M) | Speed n (RPM) | Power N | | Effciency η (%) | Allowable suction head Hs (M) | Inletant outlet diameter (mm) | Impeller diameter (mm) | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| ($m^3$/h) | (L/Sec) | | | Brake power (HP) | Motive power (HP/KW) | | | | | |
| 1690 | 496 | 7.6 | | 41.9 | | 83.4 | | | | |
| 1980 | 550 | 6.2 | 580 | 38.9 | 60/45 | 86.0 | 5 | | | |
| 2180 | 606 | 5.3 | | 39.1 | | 80.4 | | 500 | 556 | 790 |
| 2127 | 591 | 12.0 | | 83.4 | | 83.4 | | | | |
| 2492 | 692 | 9.8 | 730 | 77.3 | 120/95 | 86.0 | 6 | | | |
| 2744 | 762 | 8.4 | | 78.0 | | 80.4 | | | | |

Notice: Weight means pump weight, elbows, belt pulley or coupling, bottom valve are not included.

26HBC—40Mixed—flow pump Performance curves

650HW—7S 型混流泵性能曲线图

(n=485 转/分)




| Capacity Q | | Head H (M) | Speed n (RPM) | Power N | | Effciency η (%) | Allowable suction head Hs (M) | Inletant outlet diameter (mm) | Impeller diameter (mm) | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| ($m^3$/h) | (L/Sec) | | | Brake power (HP) | Motive power (HP/KW) | | | | | |
| 3060 | 850 | 7.4 | | 70.9 | | 87 | | | | |
| 3400 | 944 | 6.5 | 450 | 66.8 | 120/90 | 90 | | | | |
| 3960 | 1100 | 5.0 | | 62 | | 87 | 5 | 650 | 730 | 1800 |
| 3295 | 915 | 8.6 | | 88.7 | | 87 | | | | |
| 3663 | 1017 | 7.6 | 485 | 84.2 | 135/100 | 90 | | | | |
| 4244 | 1185 | 5.9 | | 78.8 | | 87 | | | | |

Notice: Weight means pump weight, elbows, belt pulley or coupling, bottom valve are not included.

## Ⅵ Troubles and Remedies

| Troubles | Causes | Remedies |
|---|---|---|
| NO water is pump out. | 1. Pouring water or evacuation is not enough.<br>2. Leakage in suction piping sys — tem.<br>3. Actual suction head is toohigh.<br>4. The direction of rotation is wrong.<br>5. The actual total head exceeds range of application. | 1. Pouring water or evacuating continuously.<br>2. Inspect and make no leakage occur.<br>3. Install the pump in a lower position.<br>4. Change the direction of rota — tion.<br>5. Decrease the total head. |
| Pump runs normally for a few minutes and then ceases to deliver water | 1. Too much bubbles surrounding the suction pipe.<br>2. There is air within snction pipe.<br>3. Leakage in suction piping system.<br>4. Some arresting materials in the impeller or inlet piping systme. | 1. Bottom of suction pipe should be about one meter below water level.<br>2. Get the air out.<br>3. Inspect the gaskets and tighten the nuts.<br>4. Taking off. |
| Insufficient discharge | 1. Some arresting materials in the impeller or inlet piping systme.<br>2. Speed is too low or motive power is not enough.<br>3. The actual head is too high.<br>4. The impeller and pump shroud wear out and clearance is too large.<br>5. The delivery valve is opened not widelyor the check valve is clogged.<br>6. The inlet pipe under water level is not enough. | 1. Taking off.<br>2. Adjusting.<br>3. Decreasing.<br>4. Repair the worn parts or adjust the clearance by paper gaskets.<br>5. Open the deliverv valve or take off the arresting materials.<br>6. The end of inlet pipe should be about one meter below water level. |

| Troubles | Causes | Remedies |
|---|---|---|
| Brake power too large | 1. The speed is too high.<br>2. The shaft is bent.<br>3. The packing is too tight.<br>4. The bearings wear out or break.<br>5. The belt is too tight. | 1. Decreasing.<br>2. Adjusting.<br>3. Loosen the gland nuts or take out the packing and make it narrower.<br>4. replacing.<br>5. loosening. |
| Noise and vibration | 1. Two shafts not lie on same straight line.<br>2. The shaft is bent or bearings wear out too much.<br>3. The nuts of foundation bolts has loosened.<br>4. The impeller is clogged.<br>5. Cavitation within the pump due to a too high suction head.<br>6. There is something inside the pump. | 1. Adjusting.<br>2. Adjusting or replacing.<br>3. Tightening.<br>4. Taking off.<br>5. Install the pump in a lower position.<br>6. Take it off. |
| Bearings are over — heated | 1. Lubricating oil or grease is in — sufficient.<br>2. Lubricating oil or grease is bad or dirty.<br>3. Two shafts not lie on same straight line.<br>4. Bearings wear out.<br>5. The belt is too tight. | 1. Adding.<br>2. Wash the bearings and bearing case and replace the lubricant.<br>3. Adjusting.<br>4. Replacing.<br>5. Loosening. |
| Packing is overheatde | 1. Packing is pressed too tightly or unevenly.<br>2. The packing is pressed obliquely to cause uneven friction with shaft sleeve. | 1. Loosen the gland nuts and tighten them regularly.<br>2. Loosen the gland nuts and tighten them evenly. |

| Troubles | Causes | Remedies |
|---|---|---|
| Too much leakage in packing | 1. Packing is too loose.<br>2. Position of joints of packing is bad.<br>3. Packing size is wrong or packing wears out.<br>4. Shaft sleeve wears out. | 1. Tignten the gland nuts adeguately.<br>2. The joints of packing should be placed in opposite direction alternatively.<br>3. Replacing<br>4. Replacing |