

COOX

安装及操作维护说明书

Installation and Operating Instruction Manual

ASP 系列中开泵 Axial Split Case Pumps



克奥兹泵业（深圳）有限公司

COOX PUMPS INDUSTRIAL (SHENZHEN) CO.,LTD.



1. Installation

1.1 Preparation for Shipment

All flanges and exposed finished metal parts are cleaned of foreign matter and treated with an anticorrosion compound, such as grease, Vaseline, or heavy oil. For protection during shipment and erection, all pipe flanges, pipe openings and nozzles are protected by wooden service flanges or by screwed-in metal plugs, which prevent the entrance of dirt, dust, moisture or foreign matter. All small piping is cleaned, and protective guards are installed, if necessary.

1. 安装

1.1 包装运输前的准备

所有的法兰及暴露在外的金属部分必须擦拭干净，去除杂质并用防锈剂处理，如油脂、凡士林或重油。为在运输及竖起时防止损坏，所有的管道法兰、管口均须用木质法兰或带螺纹的金属塞保护，用以防潮、防止赃物、灰尘进入。必要时，所有的小管路也应在清洗后装上保护装置。

1.2 Care of Equipment in the field before use

The equipment should be inspected and checked against the shipping manifest immediately on receipt of the shipment. Any damage or shortage should be reported to the transportation company's local agent.

If the equipment is received at the site before it can be used, it should be immediately stored in a dry location. The protective flanges and finished should remain on the pumps. The bearings and couplings must be carefully protected against sand, grit, or other foreign matter, and the pump rotor should be turned over by hand at frequent intervals to prevent rusting or binding. Sometimes a rotor will become slightly bound in storage. To free it, the thrust bearing should be removed or dismantled. Moving the rotor a few times will free it at the wear rings or wherever it has become bound at the internal clearances.

If a pump must be stored for an extended period of time, more thorough precautions are required. The pump should be carefully dried internally with hot air or a vacuum-producing device to avoid rusting of internal part. Once free of moisture, the pump should be filled with a protective fluid such as light oil, kerosene, or antifreeze. All accessible parts, such as bearings, couplings, should be dismantled, dried, and coated with Vaseline or acid free heavy oil, after which they should be properly tagged, wrapped and boxed to avoid metal-to-metal contact, and stored.

If rust preventative has been used on stored parts, they should be thoroughly cleaned before final installation. Extreme care must be taken to assure that all traces of the protective coating are removed and the bearings are re-lubricated.

1.2 安装前的保管

接收水泵时，应立即检查运单，发现任何损坏或缺陷均应立即告知运输公司。

如果在安装现场收到泵时不能马上安装使用，应及时存放在干燥的地方。保护性木质法兰及其它装置应继续装在泵上，轴承与联轴器应仔细保护，防止尘土、沙粒或其它异物降落其上。电机应经常用手转动以防锈蚀或卡死。在有些情况下，电机长时间存放不安装会发生转动不灵活的现象。为使其转动灵活，推力轴承应松开或拆散，经常转动转子可以使磨擦副或其它可能发生卡死的部

位保持活滑。

如果水泵需要长期保存，应采取更多的彻底保护措施，水泵内部应用热空气或真空装置进行干燥，以防内部产生锈蚀。干燥后，水泵应用保护性液体充填，如轻油、煤油，或防冻液。所有的易接触到的部件，如轴承、联轴节等应拆下，干燥并涂上凡士林油或防酸重油，然后恰当地打上标签，包好装箱，防止金属与金属间的直接接触，并妥善保管。

如果在储存的部件上使用了防锈剂，安装前应将这些零部件擦拭清洗干净，保证彻底去净所有的油迹，轴承应重新润滑。

1.3 General Rules for Pump Location

Pumps installed indoors, in poorly lighted and cramped locations, or where dirt and moisture accumulate, are improperly placed for dismantling and repair; they will be neglected and both pump and driver may become damaged. Pumps should be placed in light, dry and clean locations whenever possible.

If a motor driven unit will be operated in a damp, moist, or dusty location, the proper motor must be selected. Pumps and drivers designed for out door installation are specially constructed to withstand exposure to weather and usually are readily available for overhaul.

Sufficient room must always be provided for dismantling the pump; that is, enough headroom must be allowed so that the upper half of the casing may be lifted free of the rotor. For large pumps with heavy casings and rotors, travelling crane or facilities for attaching a hoist should be provided over the pump location.

When pumping equipment must be used at levels where flooding is possible, an auxiliary wet-pit pump must be provided for an insurance against damage to the main equipment.

Pumps should be located as close as possible to the source of liquid supply. When possible, it is advisable to locate the unit below pumping level of the water, to facilitate priming. The manufacturer's recommendations for suction conditions should always be followed.

For most pumping units, more satisfactory service is obtained when rigid foundations are provided.

1.3 水泵安装位置的一般要求：

水泵如果安装在室内光线不足的狭窄地方，或是安装在易积聚污垢与潮湿的地方，不便于水泵的解体与维修，也很容易忽视保养，使得水泵连同电机很可能损坏。条件许可的情况下，水泵应尽量安装在光线充足、干燥且清洁的地方。

如果机组装于潮湿、多水多尘的地方，应选用适合的电机。装于室外的水泵与电机要用特殊的工艺制造来满足暴露野外的工作环境，而且要便于检查。

水泵应安装在足够大的房间中以便拆解，这是因为方便地提起上泵盖应有足够的房间高度。对于具有沉重壳体及转动轴的重型水泵来说，在其上方应挂有带有提升装置的可移动起重机或其它起



吊工具。

当水泵安装于可能溢水的地方，应使用一台专用抽水泵来防止主泵损坏。

水泵应尽可能安装在靠近水源的地方。在可能的情况下，建议将整个设备安装于水池水位以下，以防缺水。水泵制造厂建议的抽水条件必须始终遵守。

对于绝大部分水泵来说，基础越坚固，运转越平稳。

1.4 Foundations

The foundation should be sufficiently substantial to absorb any vibration and to form a permanent, rigid support for the base plate. This is important in maintaining the alignment of a direct connected unit. In building the foundation, the top of the foundation should be left approximately one inch low to allow for grouting. Foundation bolts of the proper size should be embedded in the concrete, located by template. A pipe sleeve about 2 1/2 diameters large than the bolt should be used to allow movement for the final positioning of the bolts.

1.4 基础：

用于水泵安装的基础应足够坚固以吸收任何可能的振动，并构成经久且坚固的底座支撑。这对于直联泵组找正和维持非常重要。构筑基础时，顶面应留出约 1 英寸的高度用于抹面。符合要求的地脚螺栓应埋入混凝土中，并固定在模板上。要埋入一根直径比地脚螺栓大 2.5 倍的套管，便于地脚螺栓精确定位时在里面移动。

1.5 Alignment

When the unit is received with the pump and driver mounted on a common baseplate, it should be placed on the foundation and the coupling halves disconnected. The coupling should not be reconnected until all alignment operations have been completed. A gap of about 3/4" to 1-1/2" should be allowed between the baseplate and the foundation to allow for grouting. Adjust the metal supports or wedges until the shafts of pump and driver are level. Check the coupling faces as well as the suction and discharge flanges of the pump for horizontal or vertical position by means of a spirit level. Correct the positions, if necessary, by spaced far enough apart such that they cannot strike each other. Due allowance should be made for wear of the thrust bearings. A minimum dimension for the separation of the coupling halves is usually specified by the coupling manufacturer and reference should be made to their instruction sheet to ensure gap is correct. Check for angular alignment by inserting a taper gauge or feelers between the coupling faces and comparing the distance between the faces at four points spaced at 90 degree intervals around the coupling. The unit will be in angular alignment when measurements show that coupling faces are the same distance apart at all points.

Check for parallel alignment by placing a straight edge across both coupling rims at the top, bottom and at both sides. The unit will be in parallel alignment when the straight edge rests evenly on the rim at all positions. Allowance may be necessary for temperature changes and for coupling halves that are not of the same outside diameter. Care must be taken to have the straight edge parallel to the axes of the shafts.

Angular and parallel misalignment are corrected by adjusting the shims under the pump or driver, or relocating positioned units on the baseplate. After each change, it is necessary to check the alignment of the coupling halves. Adjustment in one direction may disturb adjustment already made in another direction. When alignment is correct, the foundation bolts should be tightened evenly but not too firmly. The unit can then be grouted to the foundation. Foundation bolts should not be fully tightened until the grout has hardened-usually about 48 hours after pouring. After the grout has set and foundation bolts have been properly tightened, the unit should be checked for parallel and angular alignment and, if necessary, corrective measures taken. Alignment should be checked again after unit has been connected to the pipework.

Direction of rotation of the driver should be checked to make certain that it matches that of the pump. Pump direction of rotation is indicated by a direction arrow on the pump casing. The coupling halves can then be reconnected. Once the pump has been running for about ten hours, the coupling halves should be given a final check for misalignment due to pipe strains or changes in temperature. If the alignment is correct, both pump and driver should be doweled to the baseplate.

Both suction and discharge pipes should be supported independently near the pump to ensure that when flange bolts are tightened no strain will be transmitted to the pump casing. A check valve and a gate valve should be installed in the discharge line. The check valve, placed between the pump and the gate valve, is to protect the pump from excessive pressure and to prevent water running back through the pump in case of failure of the driver. The gate valve is used in priming, starting and when shutting down the pump. Except on axial flow and mixed flow pumps, it is advisable to close the gate valve before stopping the pump. This is especially important when the pump is operated against a high static head. If taper pipes are used to increase the size of discharge piping, they should be placed between the check valve and pump.

1.5 对中找正：

接收到包括装在底座上的水泵、电机的整个设备时，应将其固定在基础上并将联轴节分开，只有在全部的调校工作完成后方可结合联轴节。在基础与底座间应留有 $3/4$ 至 $1\frac{1}{2}$ 英寸的间隙用以抹面。调整金属垫块或斜铁直至泵轴与电机轴均达到水平。检查联轴节外圆和端面以及进、出水口法兰，用撬杠调整泵体的水平与垂直位置，必要时调整底座下的垫块或楔子。联轴节端面间要留有足够的距离以确保二者不相互敲击。推力轴承必须预留允许的磨损量，联轴节生产商通常给出联轴节两端面间的最小距离并在说明中注明，调整时要严格遵守以确保其间隙正确。

在联轴节端面间插入一个量具或厚薄规检查角度对中，在两个半联轴节上相距 90 度的四个点上对比 间距。当测量结果表明联轴节端面间距在任意点均一致时，即可认为角度对中正确。

在两半联轴节的外圆用直尺贴住顶部、底部和两侧，检查平行对中。当直尺显示在任意位置边缘差距一致，则整个设备轴线已平行对中。由于温度可能发生的变化以及联轴节的两个部分外圆直径不同，允许存在一定的径向差。测量时必须保持直尺与轴线平行。

角度与平行不对中可由调整泵或电机下的垫片调整，或改变整个设备在底座上的位置调整。每改变一次均应重新检查联轴节的轴对中情况。在一个方向上所作调整会影响到另一个方向上已完成



的调整，轴对中调试好后，应均匀地紧固底座上的螺栓但不要紧，然后整个设备可以在基础上灌注水泥，只有当水泥完全硬化后方可紧固地脚螺栓，一般灌注 48 小时后水泥完全变干。当水泥干燥且地脚螺栓正确紧固后，应再次检查轴的平行与角度对中，若必要，再次调整。当泵连到管道上之后，应再次调整轴对中。

电机旋转方向应符合泵的要求，泵的正确转动方向由泵壳体上的箭头标识出来，然后将联轴器连接起来。由于管道的张力及温度的变化，泵转动大约 10 小时后作最后的轴对中检查。如果对中正确，泵和电机均应用销钉销紧在底座上。

进、出水管道均应在泵体附近处设立独立支撑，以保证法兰螺栓紧固后水泵壳体不承受应力。在出水口处应安装一个止回阀和闸阀，止回阀应安装在泵与闸阀之间，用来避免泵承受过高压力，而且防止电机故障时水倒流。在水泵试车、启动和关闭的时候都要用到闸阀。除轴流与混流泵外，建议在关泵前先关闭闸阀，当泵在高压头下工作时这一点尤其重要。如果用锥形管增大出水管道，应将其安装在止回阀与泵之间。详见有关手册。

1.6 Piping

Satisfactory operation cannot be maintained when piping imposes forces and torques on the pump. A pump can be seriously affected in this way and it is important, therefore, that the alignment should be checked again after the pipes are finally fitted. Piping flanges must be brought squarely together before the bolts are tightened. The suction and discharge piping and all associated valves and similar equipment should be supported and anchored near the pump, but independent of it, so that no strain is transmitted to the pump casing.

1.6 管道：

当泵体承受应力或弯矩时，水泵运转会不正常，水泵很容易由于法兰处螺栓拉伸而发生变形或移位，同时轴对中将受到严重影响。因此，当管路最终联接完成后，应认真重新检查轴对中情况。在紧固螺栓之前应将管道法兰对正好，进、出水管道、相应的阀门及相关的设备应在靠近泵的位置支撑稳固好，但须独立于泵，以便水泵壳体不会承受传递来的应力。

1.6.1 Suction Piping

The major source of trouble in centrifugal pump installations, other than misalignment, is a faulty suction line. The suction piping should be as short and as direct as possible. If a long suction line is required, the pipe size should be increased to reduce friction losses. The suction piping should be laid out with a continual rise towards the pump, without any high spots, to prevent the formation of air pockets, which invariably cause troubles. Only eccentric reducers, installed straight side up should be between the suction piping and the pump suction flange.

Elbows and other fittings next to the pump suction should be selected and arranged carefully, or the flow into the impeller will be unfavourably disturbed. Long radius elbows are generally preferred for suction lines, as they create less friction and provide a more uniform flow distribution than standard elbows.

After installation, the suction piping should be blanked off and hydrostatically tested for air leaks before the initial start-up.

1.6.1 进水管道：

离心泵安装中遇到的最大问题除轴不对中外，就是进水口管道安装错误。进水管道应尽可能短且尽可能直，如果需要一个长的进水管，则必须加大管口直径以补偿水流的磨擦损失。进水管应在朝向泵的方向逐渐抬高，不含任何凸点，防止气泡形成，气泡总是制造麻烦。只有偏心大小头可以安装在进水管道与泵的进水法兰之间。

进水弯头及水泵的其它管件应仔细挑选和安装，否则进入叶轮的水流会被搅乱。通常在进水管处使用大半径弯管，比起采用标准弯管来，这样可以降低水流磨擦损失并提高出水量。

安装结束后，应把进水管道用盲板封上，在试车起动前进行静水压试验以检查是否存在漏气现象。

1.6.2 Discharge Piping

Generally, both a check valve and a gate valve are installed in the discharge line. The check valve is placed between the pump and the gate valve and protects the pump against reverse flow in the event of unexpected driver failure. The gate valve is used when priming the pump or when shutting it down for inspection repairs.

1.6.2 出水管道：

在出水口处通常安装一个止回阀和一个闸阀，止回阀安装在泵和闸阀之间，防止电机故障时水倒流；闸阀在试车、停泵或检查维修时使用。

1.7 Instrumentation

A number of instruments are essential to maintain a close check on the performance and condition of the installed centrifugal pumps. A compound pressure gauge should be connected to the suction of the pump and a pressure gauge connected to the discharge. Pressure taps are provided in the suction and discharge branches for this purpose.

It is also advisable to provide a flow-metering device, as it is impractical to determine the capacity delivered by the pump with any degree of accuracy without one.

1.7 仪器仪表：

离心泵安装完成后，其出力和运行状况的准确检测需要使用一些仪器仪表，在进水口处应装上一块复合式压力表，在出水口处也安装一块压力表；在进水口和出水口处均预装有安装压力表的接头。

由于不可能准确估计出水泵的泵水流量，建议安装一个流量计测量流量。

2 Priming

Centrifugal pumps should almost never be started until they are fully primed, that is, until they have been filled with the liquid pumped and all the air has escaped.

These pumps are not self-priming and if a pump fails to generate its rated pressure in starting, it must be stopped at once and re-primed.

It is not good practice to run centrifugal pumps dry, unless they have been specially designed for this condition. Their efficient running is dependent on fine running, clearances, which are lubricated by the pumped liquids, and any attempt to run the pump dry or part full may result in

trouble.

All that is required to prime pumps with a positive inlet head is to open air cocks at the top of the pump casing and the inlet isolating valve, The liquid will then drive the air through the air cocks, which must be closed when priming is complete, and before the pump is started. It may be advisable to turn the rotating element of smaller by hand, so clearing air, which may be trapped in the pockets formed by curved impeller vanes.

There are two methods of priming pumps drawing from an elevation lower than the suction branch:

- By exhausting the air form the casing. To allow this method, the stuffing boxes must be sufficiently air tight, or they should be liquid sealed from some external supply. Some form of sight gauge is usually fitted to indicate when the casing is properly primed.
- If the suction pipe is fitted with a foot valve, the pump can be primed from some external supply under pressure; the pressure imposed on the pump must not be greater than that for which it is designed.

2 充水试车：

绝大多数离心泵只有在充满水后方可起动，即在水泵充满水并且完全排出空气之后。

这种水泵不能自动充水，在起动后若达不到额定的压力应立即停泵，检查且重新充水。

任何试图干转水泵的企图都是要不得的，装有机械密封的水泵尤其严禁干转！除非水泵本身特殊设计可以适合此条件。水泵高效率的运转取决于转动部分的平稳、适合的间隙（由泵送介质润滑），任何干转或在水未全部充满时运转的企图都将导致水泵损坏。

水泵试车前所需做的工作是：松开水泵上盖顶部的放气螺丝和进水管截止阀，水将会把空气从放气口挤出，建议手动盘车以排净存在于叶轮曲线部位的空气。当充水完成，起动水泵之前再关闭放气阀。

有两种方法来解决抽水水位低于进水口时的水泵充水问题：

- 从泵腔抽气：使用这种方法，填料函必须密闭良好或不透水，通常安装可目测测量仪器来显示泵内是否已充满水。
- 如果进水口处装有底部止回阀，可以加压用外部水源向泵内充水放气；加在泵上的压力不可以高于设计的水泵最高承受压力。

2.1 Final Check before Start-up

After a centrifugal pump has been properly installed and all necessary precautions have been taken in aligning with its driver, it is ready for service on its initial start. The following basic checks should be completed before the pump is started.

- Bearings filled with the correct amount and type of grease.
- Pump driver alignment is within tolerance.
- Motor direction of rotation is correct.
- Coupling guard is in place and bolted down.

- Pressure gauges mounted on both pump suction and discharge with correctly ranged pressure gauges fitted. Pressure gauges should not be installed at the bends in the piping, where their readings may be affected by the kinetic energy of the fluid.
- All blanks removed and the pump suction valve fully open.
- Pump discharge valve is fully closed.

2.1 启动前的最终检查：

一台离心泵安装妥当，而且泵与电机找正对中的所有必须程序已经结束，水泵机组已经具备启动条件，启动水泵前应完成如下基本检查：

- 轴承已加注正确种类及数量的润滑脂。
- 水泵及电机对中有在允许的偏差范围内。
- 电机转向正确。
- 联轴节防护罩安装到位且螺栓紧固。
- 水泵进、出水口安装了合适的压力表。压力表不可安装于管道弯曲处，因为此处水流的动能会影响压力表的读数。
- 拆除所有盲板且进水口阀门开到最大。
- 水泵出水口阀门完全关闭。

2.2 Starting and Stopping Procedures

The starting procedure is as follows:

- Prime the pump, opening the suction valve and closing the drains to prepare the pump for operation.
- Start the motor.
- Open the discharge valve slowly.
- Observe the leakage from the stuffing boxes. If the packing is new, do not tighten up on the gland immediately, but let the packing run in before reducing the leakage through the stuffing boxes.
- Check the general mechanical operation of the pump.

The stopping procedure is as follows;

- Close the gate valve.
- Stop the driver.

2.2 启动与停泵程序：

启动程序如下：

- 水泵充水，打开进水阀门，关闭放水、排气阀门，做好水泵启动的准备。
- 启动电机。
- 缓慢打开出水口阀门。
- 观察填料函的泄漏情况，如果填料是新的，不要立刻上紧填料压盖，让泄漏浸透整个填料函内的盘根后再去管它。
- 检查水泵转动时的一般机械状况。

关闭程序如下：

- 关闭出口闸阀。
- 停止电机。

3 General Rules on Pump Operation

3.1 Running a pump dry:

Only a centrifugal pump with excessive clearances between stationary and rotating parts could run dry for an indefinite period of time. Most centrifugal pumps have close clearance leakage joints and cannot run dry at all, or in some cases for longer than a few seconds, without being seriously damaged.

The one exception to this rule is a particular design of automatic priming used with large, low head pumps. The pumps is started dry when the vacuum pump is started and runs dry for not more than two minutes, at which time the priming has been completed and the pump goes into normal operation. To insure successful operation under these conditions, the clearances at the wearing rings are made slightly larger than in the normal design.

3 水泵运行的一般规则：

3.1 严禁缺水干转：

只有一种静止件与转动件之间的间隙较大的离心泵可以短暂干转，绝大多数离心泵密封处的转动件与静止件的配合紧密，完全不允许干转，甚至几秒钟的干转即会引起严重损坏。

对此规则的一个例外情况是一种特别设计的可自动充水的低压重型泵。当真空泵启动后，这种泵才能干起动，而且干转不得超过两分钟，在这段时间内泵内充水排气完毕，进入正常运行状态。为保障成功运转，磨擦副之间的间隙通常设计地比一般水泵大。

3.2 Throttling at the pump suction:

Throttling the suction of a centrifugal pump causes a reduction of the absolute pressure at the inlet to the impeller. This can be made to result in a reduction of capacity by forcing the pump to operate “in the break”, and reducing the delivered capacity by altering the shape of the head-capacity curve. Such operation is harmful to the pump. Pump efficiency is reduced when operated “in the dark”, but most important, erosion and premature destruction is caused by cavitation induced when the suction is throttled.

Pump capacity can be reduced simply and safely by throttling the discharge. In this manner, artificial friction losses are induced by throttling, and a new system-head curve is obtained, which intersects the head-capacity curve at the desired flow.

Throttling at the suction is permissible only when the suction pressure exceeds the minimum requirements by a large margin, such as the case of the second pump in series unit. The effect, however, is not to reduce capacity by operation in the break, but rather by the reduction of the total net head generated by the series unit. This causes the head-capacity characteristics and the system-head curve to intersect at a lower rate of flow.

3.2 在进水口节流：

离心泵进水端节流会引起水泵叶轮进水压力降低，这将导致水泵运行于“短水”状态，由此造成水泵流量减小，使扬程-压力曲线曲率变大。这种运行会损坏水泵，“短水”运行降低泵效率，更为重要的是：在进水端节流引起的气穴会造成零件腐蚀，水泵过早损坏。

减小水泵流量可以简单且安全地通过出水口节流来实现。人为的磨擦损失因节流而产生，我们可以获得一个新的扬程-流量曲线，它与原扬程-流量曲线交汇于企望的流量值处。

只有当进水压力大大高于最小需求压力，例如在系统中还有第二台水泵，才可在进水口节流。然而流量的减少并不通过进水节流而达到，而是通过减小整个水泵系统净扬程来达到此目的。这将使扬程-流量特性曲线与系统扬程曲线在一个低流量值处相交。

3.3 Restarting motor-driven pumps stopped by power failure:

If a check valve protects a pump against reverse flow after a power failure, there is generally no reason why the pump should not be restarted once current has been re-established. The type of motor control used will determine whether or not the pump will start again automatically once the power is restored. Starters are made with low-voltage protection, with low-voltage release, or without either. Starter with low-voltage protection will de-energise under low-voltage conditions, or following power failures, and the unit they control must be restarted manually. Starters with low-voltage protection can only be used with momentary contact pilot devices and cannot be used with maintained-contact pilot devices, such as float switches, unless auxiliary relays are incorporated in the controls.

If the starter does not incorporate low-voltage protection, resumption of power will always cause the unit to start again automatically. Because pumps operating on a suction lift may lose their prime during the period when power is off, starter should be provided with low-load protection for such installations. This does not apply, of course, if the pumps are automatically primed, or if some protection device is incorporated so that the pump cannot run unless it is primed.

3.3 重新启动断电停机的水泵：

如果水泵装有止回阀在断电后防止水的倒流，通常在电源恢复后没有不得立即启动水泵的理由。电机的控制方式将决定在电源恢复后能否再自动启动。通常起动器带有低电压保护，低电压断电，或二者都没有。带有低压保护的起动器会在电压过低或电源故障时断开电源，由此控制的单元必须手动重新启动；低电压保护起动器只能与瞬时触点接触器一起使用，而不能与非瞬时触点接触器一起使用，例如浮子开关等，除非控制装置中带有辅助继电器。

如果起动器中没有低电压保护装置，恢复供电总会使水泵自动重新启动。断电时由于水泵正在抽吸状态运行，吸入压头会因断电期间消失进而而造成水泵缺水，在这种情况下，起动器必须配有低载荷保护。当然，如果水泵装有自动充水装置，或者装备有某种水泵在未充满水时无法启动的装置则另当别论。

4 Maintenance

4.1 Daily Observation

Pump installations that are constantly attended should be inspected hourly and daily. A card record system is unnecessary for these inspections, but the operator should immediately report any irregularity in pump operation. A change in the sound of a running pump should be investigated immediately. Bearing temperatures should be observed hourly. An abrupt change in bearing temperature is much more indication of trouble than a constant high temperature.

Stuffing box operation should also be observed hourly. The stuffing box leakage should be checked to see whether it is sufficient to provide cooling and lubrication of the packing but not excessive and wasteful.



The pressure gauges and flow indicator, if these are installed, should also be checked hourly for proper operation. Recording instruments, if available, should be checked daily to ensure that the capacity output, pressure, or power consumption do not indicate that something needs attention.

4.1 日检：

水泵的安装情况须时常不断的进行每日检查，这种检查不需要填写记录卡片；但是，水泵运行中出现的任何异常现象操作者应立即汇报。对于运行水泵在声音上的改变应立即进行检查。轴承温度应每小时检查一次。轴承温度的突变比持续高温更值得警惕，更有可能是故障的征兆。

填料函运行状态也应该时常检查。对于填料函泄漏情况的检查还要检查填料函的冷却水及其对盘根的润滑应充足，但也不宜过量和浪费。

为了正常运行，压力表和流量计(如果装有的话)也应当时常进行观察，定时记录仪表读数，如可能，应每日核对确保流量、压力、能耗及其它正常。

4.2 Semi-annual Inspection

The stuffing box gland should be checked semi-annually for free movement. The gland bolts and nuts should be cleaned and oiled and inspected to see if the packing needs replacement.

The pump and driver alignment should be checked and corrected if necessary. Bearings should be checked to see if the correct amount of grease is provided and it is still of suitable consistency.

4.2 半年检查：

应每半年检查一次填料函压盖，观察泵轴转动是否自由，应保持填料压盖上的螺栓、螺母清洁上油。判断填料是否需要更换。

如有必要，应检查泵与电机的轴对中情况；轴承必须检查提供的润滑脂是否充足，是否继续有效并未变质。

4.3 Annual Inspection

Centrifugal pumps should be very thoroughly inspected once a year. In addition to the semi-annual maintenance procedure, the bearings should be removed, cleaned and examined for flaws. The bearing housing should be carefully cleaned. Bearing should be examined for scratched and wear after cleaning. Immediately after inspection, bearings should be coated with oil or grease to prevent dirt or moisture from getting into them.

The packing should be removed and the shaft sleeves should be examined for wear. The coupling halves should be disconnected and alignment checked. Drains, sealing water piping, and other piping should be checked and flushed.

The pump stuffing boxes should be repacked and the coupling reconnected.

If instrument and metering devices are available, these should be recalibrated and a test made to determine whether proper performance is obtained. If internal repairs are made, the pump

should again be tested after completion of the repairs.

4.3 每年检查：

离心泵必须每年彻底检查一次，除半年检查的内容外，轴承应拆下来清洗并检查其缺陷。轴承座应仔细清洁，轴承清洗后应该测量其擦痕和磨损。检查完毕后，应立即给轴承涂上油或润滑脂，以防灰尘和潮气浸入。

填料应当每年更换一次，轴套必须检查其磨损状况。拆开联轴节两半块，检查轴对中情况。放水孔、密封冷却水管和其它水管均应冲洗检查。

水泵填料函应重新装好填料，重新连接联轴节。

如果有测量仪器仪表，应重新校准并试验以确定这些工作是否使其获得了正常功能。如果进行了机器内部的修理，修理完成后必须重新进行试验。

4.4 Complete Overhaul

General rules cannot easily be made to determine the proper frequency and regularity of complete overhauls of centrifugal pumps. The type of service for which the pump is intended, the general construction of the pump, the liquid handled, the materials used, the average operating of the pump, and the evaluation of overhaul costs against possible power savings from renewed clearances, all enter into the decision on the frequency of complete overhauls. Some pumps on severe service may need a complete overhaul monthly, whereas other applications only require overhaul every two to four years or even less frequently.

4.4 全面检查 (大修理)：

对离心泵进行全面检查的合适周期与规范很难确定，水泵的用途、总体构造、介质种类、使用材料、运转率、以及更新部件节约的能量与大修理费用的比值等等，都应考虑进决定大修周期的因素内。不同使用的水泵某些可能每月需要做一次全面检查，与此相反，而有的泵全面检查的周期可能是每两年到四年或者更短时间一次。

4.4.1 Complete Dismantling of a Centrifugal Pump

Most pump designers and specialists consider that a centrifugal pump need not be opened for inspection unless either factual or circumstantial evidence indicates that overhaul is necessary. Centrifugal pumps should be dismantled with great care. The suction and discharge valves should be closed and the pump casing drained. These pumps can be dismantled without disturbing the suction and discharge piping. The following procedure should be followed for dismantling of the pumps:

- Remove the coupling bolts and nuts and tube fittings from upper case.
- Unscrew and remove glands. These are split across the centerline and the relationship of each half to the other is maintained with pegs or set screws. After splitting the glands the two halves can be taken away completely.
- Remove the top clamp of the bearing bracket assembly.
- Unscrew and remove all the splitting flange bolts and remove the two parallel dowel pins.
- Upper half casing then can be lifted away straight up to prevent damage to internal parts.
- Pull out the rotating assembly fitted with impeller, bearing housing and to be carried to a safe working place. This assembly should be removed vertically to prevent damage to the

impellers, wear rings and other parts.

- Release coupling pins and bushes from half coupling.
- Unscrew and remove the bearing housing covers from both ends.
- Remove the bearing housing from the rotating assembly.
- Remove the shaft lock nut and washer and pull out bearings.
- Remove the water throwers.
- Remove the casing wear rings.
- Gland packing can be removed from the sleeve together with the logging rings.
- Unscrew the shaft sleeves from the shaft and care should be taken that the sleeves are threaded in different hands—one is of R.H. and the other of L.H. marked on it.
- Now impeller is free to be removed. The impeller is press fit on the shaft and drawing tackle is recommended. During dismantling, the various parts removed must be marked to insure proper reassemble.

4.4.1 离心泵的完全解体：

大多数水泵设计师和专家们都认为不要轻易打开水泵进行检查，除非出现不得不解体的事实或征兆。

离心泵的解体必须特别小心。进出、水阀应关闭并将泵腔内存水放净。ASP 这种泵可以在不拆卸进、出水管道的情况下进行解，拆解水泵应按以下步骤进行：

- 拆下联轴节上的螺栓、螺母及水泵上盖上的管子及管件。
- 拆下填料压盖上的螺丝并移开压盖。填料盖的两个半块与泵轴垂直分开并用销子或螺丝固定住两半块的相互位置，分开填料盖后两个半块可以完全拿开。
- 拆下两轴承座上的压盖。
- 拧松并拆下壳体法兰盘上的所有螺栓和两个平行的销子。
- 然后可以竖直吊起上箱体，防止损伤内部零件。
- 取出与叶轮一起的转子总成及轴承座，放置到一个安全干净的地方。这个转子总成必须竖直拆处，以免伤及叶轮、口环和其它相关零件。
- 拆下联轴节半块上的销子和轴套。
- 卸下螺栓并拆下两端轴承座上的端盖。
- 从转子总成上拆下两轴承座。
- 拆下泵轴锁紧螺母和止退垫圈并拔下轴承。
- 拆下水挡环。
- 拆下泵体口环。
- 可以从泵轴套上拆下填料总成与垫环。
- 拧松泵轴轴套，并注意两边的螺纹方向不同——一边右旋，一边左旋，有记号。
- 到此为止，方可拆下叶轮，由于叶轮是压装在轴上的，所以建议使用拉拔工具。在拆解过程中，各零件拆开时应标记好以备正确组装。

4.4.2 Rotating Element Reassemble

The dismantling procedure should be carried out in reversed sequence for reassemble of the pump. The following care should be taken before reassemble:

- Clean the bearing housings and pump casing properly.
- Replace stuffing box packing.

- Clean the bearings and fill them with the correct amount and type of grease. In case of large axial and radial clearance, replace the bearings.

Inspect the casing wear ring and impeller neck diameter. If the diametric clearance exceeds 1 mm, replace the wear rings or both.

- All gaskets should be replaced.
- Inspect the shaft sleeves. If there is any major wear, replace them.
- Impellers must be remounted on the pump shaft so that will rotate in the proper direction, always away from the curvature of their vanes.
- The assembled rotating element should be placed in the lower half of the casing and the total lateral clearance checked. When the thrust bearing is assembled and the shaft is in its proper position, this total clearance should be suitably divided and the impellers centrally located in the casing.
- To avoid shaft distortion, all abutting joints must be square with the shaft axis and with each other, and the impeller and sleeves must not be tightened with excessive force. This will cause crushing of metal at these joints, exerting severe moments on the shaft. The shaft may become bowed under the influence of these moments and develop a marked vibration, in addition to the possibility of rubbing and binding at the internal running joints.
- If possible after assembly, the rotating assembly should be supported in its bearings or on center to check for concentricity and any eccentricity corrected.

4.4.3 Pump Reassemble

Great care must be exercised in replacing the upper half of the casing and tightening up the casing bolts. The casing bolts must be tightened precisely according to the order of tightening as indicated in numbers as shown in figure---After all the bolts have been tightened once, they should be tightened again to ensure the tightness of the casing joint. They must be tightened once more when the pump has been brought up to operating temperature.

4.4.3 水泵的重新组装：

在合上泵盖、紧固泵体螺栓时应格外小心，泵体螺栓的紧固力矩应符合图表上给出的数值。待全部螺栓初步紧固后，为保证箱体结合紧密，应再次将螺栓紧固一遍。当水泵达到运行温度时还应再紧固一次螺栓。

4.5 Spare and Repair Parts

The minimum stock of spare parts for any centrifugal pump should include a set of wear rings, a set of shaft sleeves and a set of bearings. It is often advisable to carry a complete spare rotating assembly for installation in the pump when examination shows that the pump rotating assembly has become excessively worn, or if it becomes accidentally damaged. Sufficient stock of spare gland packing for the stuffing boxes and split flange gasket should always be in stock., or ordering spare parts please provide the pump model and pump serial number as stamped on the nameplate.

4.5 备品配件：

任何一台离心泵的备件至少应包括一套口环、一套轴套和一套轴承，一般总是储备所装水泵的一整套转子总成，以备检测出转子总成严重磨损或偶然事故导致损坏时更换。填料函所用的填料应储备充足，而且在仓库里始终存放有泵体上、下盖之间的垫圈。订购备件时请提供水泵铭牌上标

明的水泵型号及序列号。

4.6 Pump Packing

4.6.1 Stuffing Box Packing:

Stuffing box packing troubles are one of the commonest causes of centrifugal pump failure. The conditions that contribute to stuffing box difficulties are:

- a) Shaft running off center because of excessive wear in the bearings, a bent shaft, or misalignment. This condition can be readily checked – first by disconnecting the coupling and rechecking the alignment, and secondly by mounting an indicator on the pump casing in the vicinity of the stuffing box to determine whether the shaft revolves concentrically.
- b) Shaft or shaft sleeves worn and scored at the packing. A routine examination of these parts will reveal whether they must be renewed or repaired.
- c) Shaft vibration due to unbalance in the rotor, cavitation, operation at extremely light flows or beyond the recommended maximum capacity, or instability in parallel operation.
- d) Plugging of the water seal connection or improper location of the seal so that no sealing liquid can enter the stuffing box. The presence of dirt or grit in the sealing liquid will similarly cause stuffing box difficulties by scoring the shaft or shaft sleeves.
- e) Excessive tightening of the gland with resulting absence of the leakage that lubricates the packing. Hourly and daily observation of the pump operation, together with the knowledge that some leakage is necessary for proper stuffing box operation, will prevent troubles from this cause.
- f) Failure to provide suitable cooling through water-cooled stuffing boxes if the pump is so fitted.
- g) Excessive clearance between the bottom of the stuffing box and the shaft or shaft sleeve, which causes the packing to be gradually pushed into the pump interior. This condition can arise when the shaft or shaft sleeves are repaired by grinding them down excessively instead of replacing them or building them up to original dimensions.
- h) Packing not properly selected for pressure, temperature, or rubbing speed conditions.
- i) Packing not properly inserted into the stuffing box because the individual rings are too short and the gap between ring ends is excessive, or because the ring joints are not staggered.

4.6 水泵填料：

4.6.1 填料函内的填料：

填料缺陷是引起离心泵故障的最常见原因之一，填料函主要缺陷表现在：

- a) 轴承过度磨损、轴弯曲或不对中引起泵轴不在中心上旋转。这种情况可以容易地检测出来—打开联轴节检查轴对中，也可以在泵体填料函的位置上装上仪表检查泵轴转动是否同心。
- b) 泵轴或轴套被盘根磨损或擦伤，对这些零件做常规检查即可判断是否需更换还是修理。
- c) 水泵轴振动可能是由于转子不平衡、气穴、流量太小或过大，或水泵轴水平运转不稳定引起的。
- d) 水封接管堵塞或水封安装位置不当引起水不能进入填料函，密封液体中含有脏物或砂粒同样会引起填料函划伤泵轴或轴套。
- e) 过份压紧填料盖以消除填料水封的渗漏。每时每日检查水泵运转状况，要懂得填料函在水泵运行中存在必要的泄漏是正常现象，要防止发生这种问题。
- f) 填料函缺少足够的冷却水通过填料函，如果水泵是如此装设的话。
- g) 填料函底与轴或轴套之间的间隙过大会导致填料逐渐被挤入水泵内部。这种情况会在以下情况产生：修轴时磨轴或轴套过多，而不是更新或将它们修复至原有尺寸。

- h) 没有按工作压力、温度或磨擦速度条件正确选配填料。
- i) 盘根未能正确填入填料函，这是由于单圈盘根太短或太长，或圈与圈之间没有相错所造成的。

4.6.2 Installing Soft Packing:

- a) Loosen and remove the gland from the stuffing box.
- b) Using a packing puller, begin to remove the old packing rings.
- c) Remove the split lantern ring and then continue removing packing with the puller.
- d) After the packing has been removed, check the sleeve for scoring and nicks. If the shaft sleeve or shaft cannot be cleaned up, it must be replaced. For the size of packing please refer to the pump data sheets.
- e) Wrap the packing tightly around a mandrel, which should be the same size as the pump shaft or sleeve. The number of coils should be sufficient to fill the stuffing box. Cut the packing along one side to form individual rings.
- f) Assemble the split packing rings on the pump. Each ring should be seated individually, with the split ends staggered 90° and the gland tightened to seat and fully compress the ring. Be sure the lantern ring is reinstalled correctly at the flush connection. Then back off the gland and retighten only finger-tight.
- g) Allow excess leakage during break-in to avoid the possibility of rapid expansion of the packing, which could score the shaft sleeves or shaft so that leakage could not be controlled.
- h) Leakage should be generous upon start-up. If the packing begins to overheat at start-up, stop the pump and loosen the packing until leakage is obtained. Restart only if the packing is leaking.

4.6.2 软填料的安装：

- a) 从填料函上松开并拆下填料压盖。
- b) 使用填料拆装工具准备拆下旧填料环。
- c) 拆下可分压环并使用拔子拆出填料。
- d) 填料全部拆出后，检查轴套是否有擦伤或划痕，如果轴或轴套不能修复则必须更换。填料尺寸详见水泵数据表。
- e) 在一根与泵轴或轴套等径的心轴上缠紧填料，填料缠绕圈数应使填料足够将填料函填满。沿一边切开填料以使其形成一个一个的填料环。
- f) 往泵上组装切开的填料环，各填料环应单独一一放好，切边相错 90° ，然后上填料压盖将各填料环压紧。要确保灯笼环在冲洗水管处安装，后推填料盖，然后继续放入填料环，再压紧盖端与填料函端有一指的间距。
- g) 允许在水泵试车时有较大的泄漏，这样可以避免填料过快膨胀，膨胀过快会划伤轴套或轴以致无法控制。
- h) 量在泵启动时一定要比较大，如果在泵启动时开始出现填料过热，停泵并松开填料直至出现泄漏，只有在填料处有泄漏的情况下方可重新启动水泵。

		<p>shaft.</p> <p>松开填料压盖并合理地重新压紧，保持漏水状态。如果没有泄漏，检查填料、轴套或轴。</p>
<p>Pump leaks excessively at stuffing 泵严重漏水</p>	<p>Defective packing 填料损坏</p>	<p>Replace worn packing. Replace packing damaged by lack of lubrication. 更换磨损的填料，更换因缺少润滑而损坏的填料。</p>
<p>Stuffing box overheats 填料函过热</p>	<p>Wrong type of packing 填料种类不对</p> <p>Shaft or shaft sleeve scored 轴或轴套划伤</p> <p>Packing too tight 填料太紧</p> <p>Packing not lubricated 填料未润滑</p> <p>Wrong grade of packing 填料等级不正确</p> <p>Insufficient cooling water to jackets 冷却水量不足</p> <p>Stuffing box improperly packed 填料装填不正确</p>	<p>Replace packing not properly installed or run in. Replace improper packing with correct grade for liquid being handled. 更换安装不适合的填料，按工作介质的要求更换为适合的填料。</p> <p>Put in lathe and machine-true and smooth or replace. 用车床及其它工具修理或更新。</p> <p>Release gland pressure. 减小填料盖的压紧力</p> <p>Release gland pressure and replace all packing if any burnt or damaged. 如果填料烧结或损坏，松开填料盖并更换。</p> <p>Check with pump or packing manufacturer for correct grade. 询问水泵或填料制造商正确的等级</p> <p>Check for open supply line valves or clogged line. 检查管线的阀门是否开启，管线是否堵塞。</p> <p>Repack 重新装入填料</p>

Packing wears too fast 填料磨损太快	Shaft or shaft sleeve worn or scored 轴或轴套磨损或划伤	Remachine or replace 重新加工或更换
	Insufficient or no lubrication 润滑不足或没有润滑	Repack, making sure packing loose enough to allow some leakage 重新填料, 使填料松弛并出现渗漏
	Packing packed improperly 填料装填不合适	Repack properly, making sure all old packing removed and box clean. 正确地重新装入填料, 换掉所有已磨损的填料, 擦净填料函
	Wrong grade of packing 填料标号不正确	Check with pump or packing manufacturer. 检查泵型, 向制造商询问正确的填料种类
	Pulsating pressure on external seal liquid line 外部密封冷却管线抖动	Remove cause of pulsation 排除抖动原因

4.6.4 Leakage to Prevent Burning and Sleeve Scoring:

防止盘根烧结和轴套划伤所允许的泄漏数值:

Pressure, lb/in ² (kPa) 压力, 磅/英寸 ² (kPa)	Leakage, drops/min 泄漏量 (滴/分钟)	(cc/min) (毫升/分钟)
0-60(0-400)	60	4
61-100(401-700)		190
101-250(701-1700)		470

4.7 Mechanical Seals

Pumps handling hazardous or expensive liquids, or liquids where the necessary leakage from a packed gland is unacceptable, are often furnished with mechanical seals.

Mechanical seals are made in a wide variety of designs to suit particular applications, the manufacturers' instructions for fitting or replacing the specific seal type used must, therefore, be followed exactly. A mechanical seal is a precision device and must be treated accordingly.

When the pump is equipped with mechanical seal. no attention or adjustment to the seal is normally required. Except for possible slight initial leakage, the seal should operate with negligible attention.



4.7 机械密封

如果水泵用于危险介质、昂贵介质，或不允许有一点渗漏的场合，通常给水泵装上机械密封。

机械密封有多种设计来满足各种不同的要求，必须严格遵守制造商关于各种机械密封的安装更换说明。机械密封是一种精密部件，必须小心安装。

当水泵配有机机械密封时，正常情况下不需要维护或调整水泵密封。除了试车时可能会出现轻微漏水外，运行当中机械密封无须过份留意。

5 General Maintenance – Wear Rings

Wearing rings are fitted in the casing and, if specified, also on the impeller. These wearing rings provide a close running clearance to maximize efficiency and they depend on the pumped liquid for lubrication. With time they will wear, clearances will increase and a greater percentage of the pumped liquid will re-circulate to pump suction. The rate if wear depends on the characters of the liquid pumped. Nominal clearances for various sizes of wear rings are shown below:

5 常规维护——口环

口环装配在泵体上，如果注明了，也可装在叶轮上。这些口环提供了较小的转动间隙，以保障最高运行效率，而且依靠泵内液体润滑。随着时间的推移，它们会磨损，间隙会增大，反流到进口口的液体比例会升高。它们的磨损率取决于所泵送介质的特性。不同尺寸的口环标准间隙如下所示：

Nominal Wear Ring Internal Diameter (mm) 标准口环名义内径 (mm)	Nominal Diametrical Clearance (mm) 名义径向间隙 (mm)
50	0.26
100	0.42
150	0.46
200	0.52
250	0.56
300	0.60
350	0.66
400	0.70
450	0.75
500	0.85

Note: Above clearances are for wear ring/impeller combinations of dissimilar metals.

注意：以上间隙值是指口环与叶轮不同金属间的配合间隙。

6 Recommended Lubricants 推荐使用的润滑剂：

Greases 润滑脂选用表

Manufacturer 制造商	Grease type 润滑脂型号
1. Atlantic Refining Co. 大西洋炼油公司	Atlantic Lubricant 54 大西洋润滑脂 54 号
2. Cities Service Oil Co. 城市服务石油公司	Trojan Grease H-2 特洛伊润滑脂 H-2
3. Continental Oil Co. 大陆石油公司	Conoco Super Lube 大陆石油超级润滑剂

4. Gulf Oil Corp. 海湾石油公司	Gulf Supreme Grease No.2 海湾超级润滑脂 2 号
5. Mobile Oil Co, 美孚石油公司	Mobililux Grease No.2 美孚润滑脂 2 号
6. Pennzoil Co. 半岛石油公司	Pennzoil 705 HDW 半岛 705 HDW
7. Phillips Petroleum Co. 菲利浦石油公司	Philube Muti-Purpose L-2 菲利浦多功能脂 L-2 型
8. Quaker State Oil Refining orp. 贵格州炼油公司	Quaker State Multi-Purpose Lubricant 贵格多用途润滑剂
9. Shell Oil Co. Inc. 壳牌石油公司	Shell Alvania Grease 2 壳牌 Alvania 润滑脂 2 号
10. Sinclair Refining Co. 辛克莱尔炼油公司	Litholine MP Grease Litholine MP 润滑脂
11. Standard Oil Co. of California 加利福尼亚标准石油公司	Chevron Industrial Grease Med. V 形工业润滑脂
12. Sun Oil Co. 太阳石油公司	Sun 72 XMP Grease or Prestige 42 太阳 72 XMP 润滑脂或威望 42 号
13. Texaco, Inc. 德士古公司	Texaco Novatex Grease No.2 德士古 Novatex 润滑脂 2 号

NOTE: Do not mix greases while the pump is in operation. Should it be necessary to change make of grease used, bearings and housings should be cleaned with kerosene and completely re-packed with new grease.

注意：不要在泵运转时加注润滑脂，防止新旧混用。需要更换黄油时，应先用煤油清洗轴承和轴承座，然后重新用新润滑脂充满。

Oils 润滑油选用表

Manufacturer 制造商	Oil Type 润滑油型号
1. American Oil Co. 美国石油公司	American Industrial Oil No. 15 美国 15 号工业用润滑油
2. Atlantic Refining Co. 大西洋炼油公司	Atlantic Hytherm Oil-C 大西洋耐热油 - C 型
3. Cities Service Oil Co. 城市服务石油公司	Pacemaker Oil No. 1 标兵润滑油 1 号
4. Continental Oil Co. 大陆石油公司	Conoco Dectol 15 R&O 大陆石油公司 Dectol 15 R &O 型
5. Gulf Oil Corporation 海湾石油公司	Gulf Harmony 44 海湾 “和谐” 44 号
6. Mobile Oil Co. 美孚石油公司	Mobil DTE Oil Light 美孚 DTE 轻润滑油
7. Pennzoil Co. 半岛石油公司	Pennbell SFI 8 半岛 SFI 8
8. Phillips Petroleum Co. 菲利浦石油公司	Magnus Oil, Grade Light 马格纳斯轻等级润滑油
9. Quaker State Oil Refining Corp. 贵格炼油公司	Quaker State Motor Oil SAE 10W 贵格发动机油 SAE 10W
10. Richfield Oil Corporation	Eagle Oil R&O, No.10



里奇菲尔德石油公司	鹰牌润滑油 R & O, 10 号
11. Shell Oil Co.,Inc 壳牌石油公司	Shell Tellus Oil Greade 27 壳牌“特勒斯”润滑油 27 号
12. Texaco, Inc. 德士古公司	Texaco Regal Oil A (R&O) 德士古“帝王”润滑油 A (R&O)

7 Pump ASP

Pump ASP is one high efficiency kind of centrifugal Pumps. There is much good character on it:

- a) High efficiencies and good NPSH is depend on through optimized flow spaces. There is no any thrust force from discharge pressure.
- b) Low NPSH requirement reduces risk of cavitation damage in low suction head conditions.
- c) High operational reliability thanks to load-independent pre-setting of the bearing & rotor unit. Bearing service life>100,000 hours in all operating ranges.
- d) In-line suction & discharge branches simplify pipework layout.
- e) Easy servicing due to solid casing split flange with only a few bolts. And do not need move suction or discharge pipe.
- f) All models fitted with standard, easy to obtain seals & bearings.
- g) All wear parts may be dismantled along with the rotor(only the casing remains in the pipe).
- h) Low wear reduces the life cycle costs.
- i) Stuffing box easily converted for use with packed glands or mechanical seals.

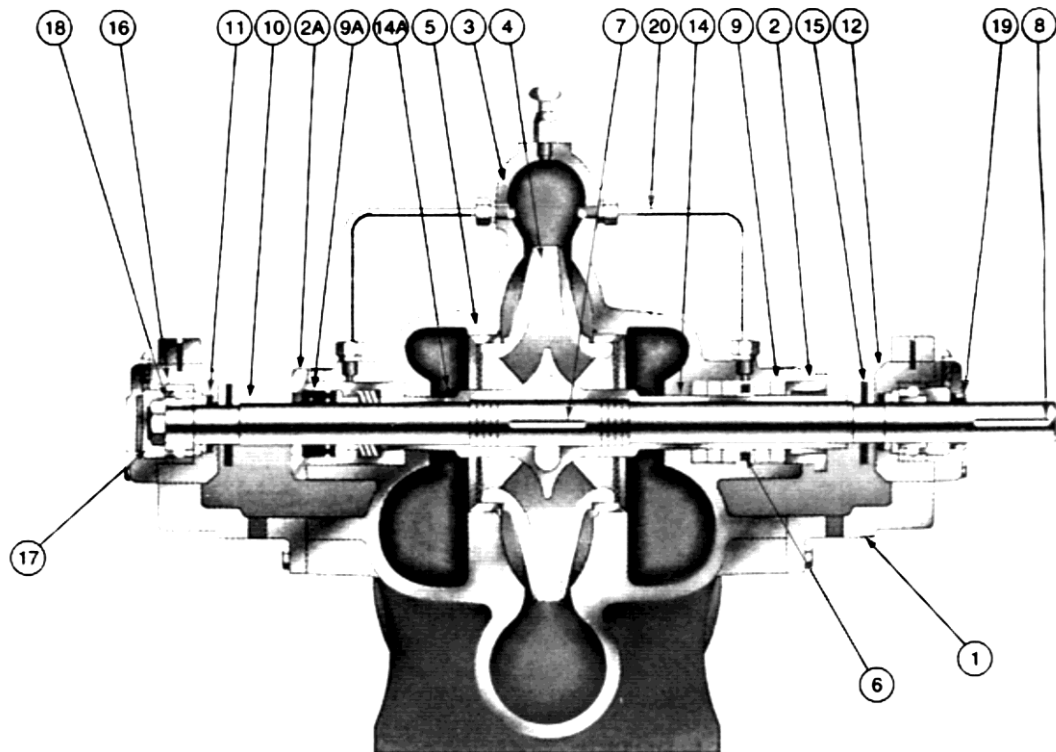
7. ASP 水泵

ASP 型水泵是一种高效水泵。它具有许多优点:

- a) 高效率和良好的净吸入压头。这取决于优良的水流通道，而且不会产生任何因出口压力所引起的轴向推力。
- b) 低的净吸入压头(NPSH)减少了气穴产生的可能性，避免在低吸入压头的条件下由此而引起的损坏。
- c) 高的运行稳定性。 这一点得益于轴承和转子总成于装配后轻松安装入泵座。正常运转情况下轴承寿命达到 10 万小时以上。
- d) 泵进、出水口布置在同一条线上有利于管道敷设。
- e) 维修方便。 只需打开少量连接上、下泵体法兰的螺栓就可揭开泵盖而无须移动进、出口管道。
- f) 所有规格进行标准配置。这样的泵易于购得轴承和机械密封。
- g) 所有磨损部件都可以从转子上拆下，只把下泵体留在管道之间。
- h) 较低的摩擦可以减小运行费用。
- i) 填料函能够方便地在使用盘根密封或者是机械密封两者之间转化。

7.1 The construction of the pump ASP is showed as below:

ASP 系列水泵标准结构如下图所示：



PARTNO. 件号	DESCRIPTION 名称	PARTNO. 件号	DESCRIPTION 名称	PARTNO. 件号	DESCRIPTION 名称
1	bearing housing 轴承座	2	Gland 填料压盖	2A	seal plate 机封静环座
3	Casing 水泵壳体	4	Impeller 叶轮	5	casing wear ring 口环
6	lantern ring 冷却水环	7	impeller key 叶轮键	8	coupling key 联轴节键
9	gland packing 填料	9A	mechanical seal 机械密封	10	Shaft 泵轴
11	thrust collar 轴承挡环	12	bearing end cover inner 轴承盖	14	shaft sleeve 轴套
14A	impeller nut 叶轮螺母	15	water thrower 甩水环	16	deep groove ball bearing 深沟球轴承
17	lock nut 锁紧螺母	18	locking washer 止退垫圈	19	bearing end cover 轴承闷盖
20	seal piping 密封管				



7.2 Standard Construction 水泵标准结构:

PART NO. 件号	STANDARD FITTED PUMP 标准水泵材料	DIN STANDARD 标准	DIN MATERIAL NUMBER 材料代号	ASTM STANDARD 标准
1	Cast iron 铸铁	GG20	0. 602	A48 class 25
2	Bronze 青铜	G-CuSn5ZnPb	2. 1096. 01	B584 C83600
2A	Cast iron 铸铁	GG25	0. 6025	A48 class 35
3	Cast iron 铸铁	GG25	0. 6025	A48 class 35
4	Bronze 青铜	G-CuSn5ZnPb	2. 1096. 01	B584 C83600
5	Bronze 青铜	G-CuPb15Sn	2. 1096. 01	B584 C93700
6	Bronze 青铜	G-CuSn5ZnPb	2. 182. 01	B584 C83600
7	Stainless steel 不锈钢	X10Cr13	2. 1096. 01	A182 Tyoe 410
8	Stainless steel 不锈钢	X10Cr13	2. 1096. 01	A182 Type 410
9	Graphite impregnated 石墨浸润盘根			
9A	John crane or equivalent John crane 或相当品牌			
10	Stainless steel 不锈钢	X10Cr13	2. 1096. 01	A182 Type 410
11	MS 低碳钢			
12	Cast iron 铸铁	GG20	0. 602	A48 class 25
14	Bronze 青铜	G-CuSn10	2. 1050. 01	B30 C90700
14A	Bronze 青铜	G-CuSn10	2. 1050. 01	B30 C90700
15	Neoprene 氯丁橡胶			
16	SKF			
17	SKF			
18	SKF			
19	Cast iron 铸铁	GG20	0. 602	A48 class 25
20	Copper 铜管			



Optional Construction 可选结构材料:

PAT NO. 件号	SPECIAL MATERIAL 特殊材料	DIN STANDARD 标准	DIN MATERIAL NUMBER 材料代号	ASTM STANDARD 标准
3	Ductile iron 可锻铸铁	GG50	0.705	A53660-45-12
	Cast steel 铸钢	GS-C25	10.619	A216 WCB
	Stainless steel 不锈钢	G-X6CrMo165	1.4008	743 Gr CF-8M
	Ni resist 含镍不锈钢	GCI-NiCuCr1562	0.6655	A436 Type 1
4	Cast iron 铸铁	GG20	602	A48 class 35
	Zinc free bronze 无锌青铜	G-CuSn10	2.1050.01	B427 C90700
	Stainless steel 不锈钢	G-X6CrMo165 G-X12Cr14	1.4008 0.6655	A743 Gr CF-8M A743 Gr CA15
5	HT Steel 高强度钢	42CrMo4	1.7225	A322 Cr4140
	Stainless steel 不锈钢	X5CrNiMo1810 X5CrNi189	1.4404 1.4301	A276 Type 316 A276 Type 304

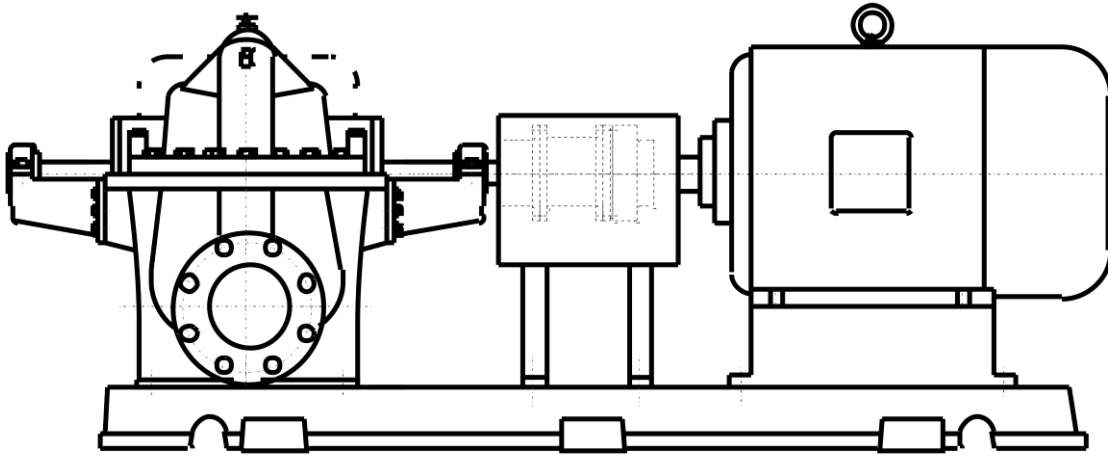
7.3 The design of the pump ASP

- Axially split case centrifugal pumps
- Single and Two stage models
- Mechanical seal mounted directly on shaft (Packed gland with sleeve available as option)
- 25 model standard range designed round 4 shaft groups
- Larger custom engineered models available on request
- 2 pole operation possible on some models

7.3 ASP 水泵设计特点：

- 轴向剖分（中开）泵体类离心泵。
- 单级或二级叶轮系列。
- 机械密封直接安装在泵轴上（盘根压盖和轴套可用于填料密封如上所示）。
- 25 种标准规格分为 4 类轴系。
- 可最大限度的满足用户不同需求。
- 某些规格的水泵可选用 2 极电机。

7.4 The overall view is showed as below 水泵外形如下图所示:



7.5 Pump Installation

● Connecting-in And Setting Level

The pump and motor shafts **MUST** be perfectly aligned to ensure a long trouble –free life for the bearings and coupling.

The shafts are aligned before dispatch but the settings may be disturbed during transport.

Furthermore, the base is flexible to a certain extent and will distort slightly if it is bolted to a foundation that it is not flat.

The result misalignment would cause:

- rapid wear to the coupling parts
- overheating and rapid wear to the pump and motor bearings
- vibration.

To avoid these problems, it is important to install the machine correctly, according to the following procedure.

First, attentively examine the machine to see that the components have not moved on the base during transport, and that the shaft ends are not out of line.

- a) The length and width of the foundation block should be approx. 15 to 20cm larger than the outer dimensions of the pump baseplate. The foundation must be rigid, level and flat. The holes must have a chamfer cut in the edge, emerging beyond the edge of the baseplate, for pouring in the grout.
- b) Put the machine on the foundation with the anchor bolts while placing steel shims under the baseplate. Shims must be at least 10mm thick and placed close to the bolts, on either side, and in the middle of the baseplate. Ensure that the shims are in intimate contact with the foundation by smoothing out the seating area carefully.

Do not grout in the holding down bolts until all the pipework to the pump has been permanently assembled.

7.6 ASP 水泵安装

● 就位和找正

水泵和电机两轴**必须**精确找正对中，以确保水泵在轴承和联轴节无故障的条件下长期运行。

电机和水泵在出厂前已经良好对中，但是在运输途中有可能被破坏。再者，底座的些许变形以及用螺栓把在一个不完全平的基座上都会引起轻微的不对中。

不对中的结果可能会引起：

- 联轴节部件迅速磨损
- 水泵和电机轴承过热和迅速磨损
- 振动

为避免此类问题的发生，非常重要的一点就是按照如下程序对设备进行正确安装：

首先要仔细检查设备以发现各部件在运输途中是否在底座上产生相对移动，两轴是否发现不对中。

a) 混凝土基础的长和宽应当比水泵基座的长和宽大出 15~20cm。此基础必须坚固、水平和平整。基础上的地脚螺栓孔洞必须在靠外边凿出一个斜溜槽，供水泥砂浆顺利灌注。

b) 把设备吊放在基础上时要穿上地脚螺栓同时给水泵基座下垫上斜垫铁。垫铁至少要 10mm 厚而且要靠近地脚螺栓两侧。要确保垫铁和基础紧密接触，可以逐渐抽动垫铁来调整。

在与水泵连接的整个管道完全彻底地结束之前，不要向地脚螺栓孔洞罐注水泥砂浆。

● Pipework assemble

The pipework must never apply any strain to the pump flanges, since it might lead to internal and external deformations on the pump and misalignment of the pump-motor shafts.

The Pump Must Never Bear the Weight of the Pipework

To avoid air pockets and resulting risk of running dry, the suction pipe must be in clined up wards until it meets the pump. If the suction pipe bore is larger than the pump inlet diameter, the reduction connection must have its top line horizontal.

● Pump-motor alignment

Check the alignment at three or four points.

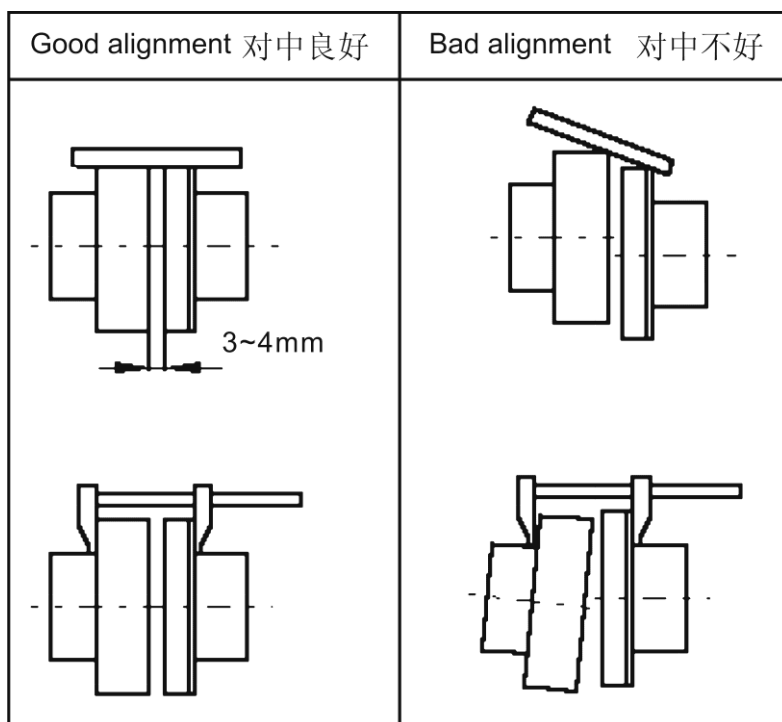
● 管道敷设

管道连接时不得向水泵法兰施加任何应力。否则可能会导致水泵内部或外部发生变形，也可能引起水泵和电机不同轴。

在任何情况下水泵都不得负担管道的重量。

为了防止气堵以及由此造成的干转，水泵进水管必须朝水泵进口向上倾斜直至满足水泵要求。如果进水管直径大于水泵进水口直径，其变径连接时其顶部必须保持水平。

● 水泵-电机找正对中



通过检测 3 到 4 个点以确定同轴度。



克奥兹泵业（深圳）有限公司
COOX PUMPS INDUSTRIAL (SHENZHEN) CO.,LTD.

网站 WEB: <http://www.cooxpumps.com>

深圳销售中心
地址：深圳市南山区海德三道海岸大厦东座 602 室
电话：0755-86290613 86290923 86290682
传真：0755-86290631