Q&A OF AILISHENG DIESEL CONSTRUCTION EQUIPMENT

1. Why is it necessary to change oil regularly?

Oil in the use of diesel engines is essential, mainly play a role in lubrication, cooling, cleaning and so on.

Therefore, many drivers will pay attention to check the amount of lubricating oil and add it according to the standard, but ignore the inspection of the quality of lubricating oil and the replacement of the deteriorated oil, resulting in some engine parts always running in poor lubrication environment, thus accelerating the wear of the parts.

Under normal circumstances, the loss of oil is not big, but it is easy to pollution, so that the protection of diesel engine. During the operation of the diesel engine, a lot of dirt (carbon smoke, carbon deposit and scale formed by incomplete combustion of fuel oil) can get into the oil. Therefore, Ailisheng wheel loaders,Ailisheng excavators,etc., requires a regular oil change.

For new or overhauled machinery, after the test run, there will be more impurities, if only add not to put into use in a hurry, it is easy to cause burning tile, axle and other accidents.

In addition, even if the oil is changed, some drivers, due to lack of maintenance experience or to save trouble, will not thoroughly clean the oil channel during the replacement, so that mechanical impurities still remain in the oil sump and oil road.

Regular oil changes can help extend the service life of Ailisheng machine products.

2. How to inject butter correctly?

Butter the cylinder mat. Butter is commonly used in engineering machinery repair grease, can play a role in lubrication and sealing.

Therefore, when installing the gasket, some repairmen butter the gasket, thinking that it will increase the tightness of the diesel engine. However, this has affected the performance of the diesel engine.

Cylinder pad is an important seal between the cylinder block and the cylinder head, it can not only seal the high temperature and high pressure gas produced in the cylinder, but also can seal the cooling water and lubricating oil in the cylinder head and cylinder body, so when disassembling the cylinder pad, we should pay special attention to its sealing quality.

If installed in the cylinder MATS and butter, when the cylinder head bolt is tightened, part of the butter will be squeezed into the cylinder in the channel and the oil duct, stay in the cylinder gasket between the butter in cylinder work, due to the effect of high temperature, part will shed cylinder combustion, others remain in the combination of the cylinder block and cylinder head, cylinder pad, cylinder head and the body plane between aperture, high temperature and high pressure gas from impact cylinder pad, easily damaged cylinder pad, cause air leakage.

In addition, the butter at high temperature for a long time will also produce carbon deposit, resulting in premature aging cylinder pad deterioration. Do not apply butter to the cylinder gasket.

Therefore, proper buttering can effectively improve the working performance and efficiency of Ailisheng construction machines.

3. Why do new cylinder liner and piston products need to be installed after matching?

When replacing the cylinder liner and piston, it is considered that the new cylinder liner and piston are both standard parts, interchangeable and ready for use.
In fact, the cylinder sleeve and piston sizes have a certain tolerance range.
If the large size of the cylinder sleeve with a small size of the piston, will make fit clearance is too large, resulting in weak compression, start difficult.
Therefore, Ailisheng cautions that standard liner and piston size grouping codes should be checked when reloading. The liner and piston should be installed so that the standard piston size grouping codes are the same as the standard liner size grouping codes so that there is a standard fit gap between the two.
In addition, the cylinder installation with the same group of code cylinder liner and piston at the same time, but also pay attention to the inspection of cylinder plug clearance before installation, in order to ensure the assembly standard, before the installation should also be a test, to prevent the installation of fake inferior products.

4. How to accurately measure cylinder clearance?

When measuring cylinder clearance, it is not possible to measure in the direction of the piston skirt perpendicular to the piston pin hole and in other directions.
The structure of aluminum alloy piston is small at the top, large at the bottom, a cone, and the skirt section is oval, so the cylinder gap along the circumference direction is not equal.
According to experienced service personnel from Ailisheng, the clearance in the direction of the ellipse axis is required when measuring, i.e. the clearance in the direction of the piston skirt perpendicular to the piston pin hole.
This measurement is more convenient, accurate, and in the reciprocating movement, the piston skirt perpendicular to the direction of the piston pin hole due to the role of lateral pressure wear larger, so, when measuring cylinder clearance, should be in the piston skirt perpendicular to the direction of the piston pin hole measurement.

5. Why can't the piston be heated with an open flame?

Since the piston and the piston pin are interference fit, when installing the piston pin, the piston should be heated to expand.
This approach is very wrong, because the piston parts are thin and uneven, the degree of expansion and contraction will be different, open fire heating will make the piston heat uneven, easy to cause deformation; The piston surface will also adhere to carbon ash, reducing the service life of the piston.
If the piston cools naturally after reaching a certain temperature, its metallographic structure will be damaged and its wear resistance will be greatly reduced, and its service life will be significantly shortened.
Therefore, Ailisheng cautions that when installing piston pins, the piston can be heated evenly in hot oil to slowly expand and should not be heated directly with an open flame.

6. Why can't you sand the bearing bush?

For some inexperienced repairmen, scraping tile is a difficult work, because scraping tile

technology is difficult to master, so the bearing bush is not easy to meet the technical requirements.

For this reason, someone in the replacement of the bearing bush, in order to increase the bearing bush and crankshaft contact area, with sand cloth grinding instead of scraping tile.

This method is highly undesirable in practical maintenance, because the abrasive particles on the emery cloth are relatively hard, while the bearing alloy is relatively soft, so the sand particles can be easily embedded into the alloy when grinding, and the wear of the shaft neck will be accelerated when the diesel engine is working and the service life of the crankshaft will be shortened. Reducing Ailisheng wheel loader, excavator products such as life.

7. Why can't the bolts be screwed too tight?

In the process of disassembly and assembly of construction machinery, many parts of the bolts are required torque requirements, such as the transmission box, cylinder head, hub, connecting rod and front bridge, tightening torque in the manual have special provisions, must not be arbitrarily changed.

However, many customers using Ailisheng forklift loader mistakenly believe that it is safer to tighten it, but tightening it too tightly can cause screws or bolts to break, and may cause failure due to thread slip.

8. Why shouldn't the tire pressure be too high?

The inflation pressure of wheel construction machinery is an important factor that determines its service life and working efficiency.

Too high or too low tire pressure will affect its service life, but also not conducive to safe driving, especially in the hot summer.

Scientific inflatable standard should be: with the standard air pressure of the tire as the benchmark, as the temperature changes, slightly adjust the tire air pressure.

For example, summer should be 5% to 7% lower than winter, because considering the high temperature in summer, the gas heated, the pressure increased, on the contrary, winter must reach the standard pressure or slightly lower.

Please control the tire pressure according to the requirements of Ailisheng products.

9. How to check the plunger stroke allowance correctly?

In the test of plunger injection pump, many maintenance personnel do not pay attention to check the travel allowance of plunger.

The travel allowance of the plunger is the amount of movement that the plunger can continue to move upward after the CAM on the camshaft reaches the TDC.

After adjusting the start time of oil supply, it is necessary to check the stroke allowance because the stroke allowance of plunger is related to the wear of plunger and sleeve.

After the plunger and sleeve wear out, the plunger has to move up a bit to start oil supply, thus delaying the start time of oil supply. When the adjusting bolt is unscrewed or the thicker adjusting block and gasket are used, the lower position of the plunger is moved up to reduce the stroke margin of the plunger.

Therefore, when maintaining and debugging the fuel injection pump, first check the stroke

allowance to determine whether the fuel injection pump is allowed to adjust. The following is a summary of the experience of repair personnel in Ailisheng loader:
When checking, the following methods should be adopted according to the different structure of the fuel injection pump:
A) after rotating the camshaft to top the plunger to TDC, remove the oil outlet valve and seat and measure with the depth vernier.
B) after the plunger is jacked to TDC, pry the spring seat of the plunger spring with a screwdriver to make the plunger rise to a high point.
The thickness gauge is then inserted between the lower plane of the plunger and the tappet adjusting bolt. The standard stroke allowance of plunger is about 1.5mm, and the limit stroke allowance after wear should be no less than 0.5mm.

10. Why can't the water tank be filled with cold water?

Overloading of the engine, poor heat dissipation or lack of water in the water tank will cause the water tank to boil. If cold water is added immediately, the cylinder head and cylinder body will burst.
Therefore, if a water tank is found boiling in use, emergency measures should be taken to stop operation and allow diesel engine cooling water to cool itself to avoid damage to Ailisheng heavy equipment.

How can Ailisheng customers save fuel?

How to control the construction machinery, which consumes a lot of oil, without reducing the working efficiency is a very important problem. After investigation found: the key to save oil is the details, in the actual work to develop a good habit, reduce fuel consumption, improve efficiency is very simple. There are several tips from Ailisheng that you can use for reference based on your own daily construction situation:

First,Ailisheng excavator arm and bucket selection techniques

Many new users will think that the larger the excavator bucket work faster, the higher the efficiency, in fact, this is a misunderstanding of understanding. Bucket capacity is determined according to the bucket stack capacity. However, due to different materials, the loading capacity in actual work also varies, such as wet clay, which may reach the bucket digging coefficient as high as 100-110%, but for some stones, the bucket capacity coefficient is relatively low.

The length of the excavator arm determines the digging force of the excavator. In the actual work of the operator, Ailisheng excavator is equipped with a short arm, which is suitable to be equipped with a larger bucket, so that the digging force is larger. With a longer arm, the mining range can be controlled more.

Therefore Ailisheng excavator users should according to the working condition of choosing

appropriate bucket, can obviously fuel efficiency. In addition to bucket, bucket tooth selection also has a lot of knowledge, penetration bucket tooth is more wear-resistant, in practical work can improve efficiency, save fuel.

Second. Ailisheng excavators with fuel-saving techniques

So what height platform is appropriate? The height of the platform is determined by the length of the bucket. The distance between the pins is the ideal height. In order to save fuel, in addition to the control of working height and distance, there is also the cycle time of digging. Each bucket of digging should be controlled within 24 seconds to 28 seconds, and 4-6 buckets should be filled with a truck within 2 minutes.

And the bucket filling coefficient is controlled at 80-110%, each bucket as full as possible. In the process of excavation, the number of rotation should be reduced as far as possible, and the rotation Angle should be reduced to less than 60 degrees. Although the rotation range of the excavator can be controlled by itself, the useless rotation range will only consume fuel oil, but it has no effect on the improvement of the work efficiency.

Three, Ailisheng excavator positioning fuel-saving skills

The correct digging method of the operator should be from right to left, because the excavator cab is located on the left side, digging from right to left, the big arm is on the right side, the line of sight will be better, which is conducive to the excavation.

Four, Fuel saving skills for truck and Ailisheng excavators

When excavator excavates and loads, the placement of truck and excavator is also a knowledge. There are two ideal loading methods. The first is over the side plate. While the excavator was digging, the two trucks were loaded upside down and over the side of the truck. This method has a full excavation range and a small swing Angle. The second way is "passing through." When a truck is loaded, have a truck come to the top immediately. This method is short, suitable for the number of trucks is relatively small, can immediately load the car, the swing amplitude is a little bit large.

Five. Ailisheng wheel loader fuel saving skills

The loader can be loaded by a method called "v-loading method". The loader is facing the material pile, and the truck and the loader drive at a 45° Angle. When loading, the loader lifts the bucket, which can put pressure on the front wheel, so that the friction force is increased and the driving force is stronger. After the bucket is filled, the loader backs up 1.5 laps of the tire to form

a v-shaped loading.

In addition to Ailisheng excavator users, also can undertake fuel-efficient in some detail, especially summarizes the points:

1. Prevent engine idling. Even at idling, there is oil circulating in the hydraulic pump and consuming fuel. If one hour out of 10 hours a day is idling, about 20 litres of fuel per month and about 230 litres per year can be saved if idling can be prevented. That's nearly 2,000 yuan.

2. Prevent overload loss of pressure. When the excavation of sand or rock load is too heavy, even pull the lever operation machinery also no action, and fell into the state of pressure loss. If 6 minutes of operating time in 10 hours per day is in the state of loss of pressure, then, if the loss of pressure can be prevented, about 70 liters of diesel oil can be saved every month, and about 840 liters of diesel oil can be saved every year, which costs nearly 5,000 yuan.

3, reduce the engine speed. Although reducing engine speed will affect the amount of operation, it can greatly reduce fuel consumption and improve fuel efficiency. That is, of course, if it doesn't make the job less efficient, which could turn off employers and cost them the job.

4. Reduce the rotation Angle. Reducing the rotation Angle when loading into the dump truck can shorten the operation cycle and increase the amount of operation per unit time, thus improving the fuel consumption efficiency. This is also an effective way to save fuel.

5. Reduce the engine speed when walking. The faster the engine revs, the more fuel it consumes while walking. Fuel efficiency can be improved by reducing the engine speed during running.

6. Implement high level excavation. In the excavation site, the higher part is firstly excavated and then the lower part is excavated. Compared with the lower part, the cycle time of high mining can be shortened by about 12% and the burn-up efficiency can be improved by about 8%.

At the same time, Ailisheng excavator operator's operation is the key to fuel economy, reduce mistakes sometimes can be fuel efficient, effectively save fuel need operator to kung fu spent on each detail, may spend bit of idea on an action can make work better.

If the engine is hot, What should do?

1. failure phenomenon

The engine is hot.

2. point of failure

- insufficient coolant
- the coolant is not replaced when it deteriorates, resulting in poor heat dissipation or blockage of the channel
- too little oil
- insufficient cooling air volume
- fan blade deformation
- radiator fins distorted or internally blocked
- clogged radiator duct

- water temperature sensor or circuit failure
- thermostat cannot turn on large loop
- the pump does not work well
- the engine ignition time is wrong and the afterburn period is too long
- engine cylinder pad damaged
- cracked engine block or head

3 Solution from Ailisheng machine service

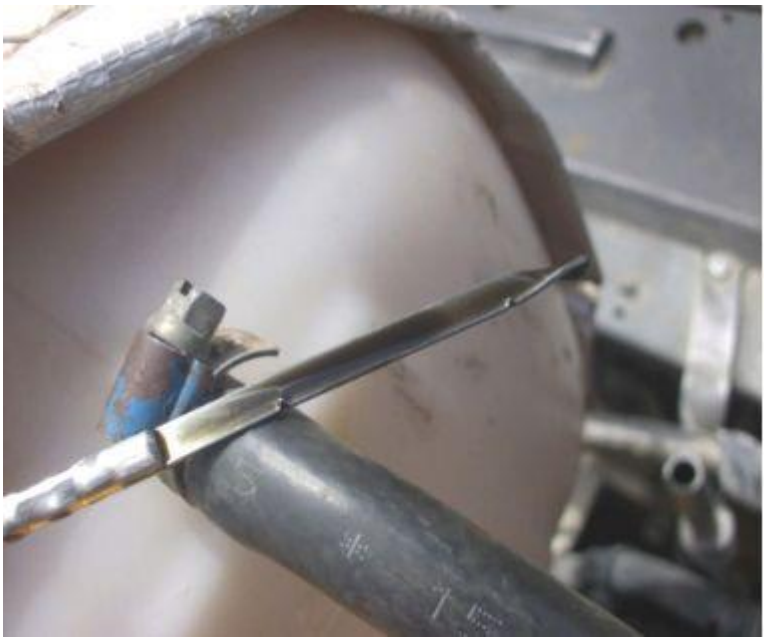
3.1 check the coolant level. If the coolant is too little, add; Otherwise, move on to the next step.

（from Ailisheng MACHINE SERVICE）

3.2 Check coolant for deterioration. Such as metamorphism, clean up the waterway after the replacement of antifreeze; Otherwise, move on to the next step.

（from Ailisheng MACHINE SERVICE）

3.3 Check oil level. If oil is too little, add or replace; Otherwise, move on to the next step.



（from Ailisheng MACHINE SERVICE）

3.4 Check the water radiator for foreign matter and the radiator duct for blockage. If blocked, clean up; Otherwise, move on to the next step.

（from Ailisheng MACHINE SERVICE）

3.5 Check whether the fan blade is out of shape and the air volume is too small. If so, replace the fan or adjust the belt; Otherwise move on to the next step.

（from Ailisheng MACHINE SERVICE）

3.6 Check water temperature sensor and circuit for short circuit or break. If yes, deal with; Otherwise move on to the next step.

（from Ailisheng MACHINE SERVICE）

3.7 Remove the thermostat and put it in hot water to observe the opening of the thermostat. If abnormal, replace the thermostat; Otherwise move on to the next step.

（from Ailisheng MACHINE SERVICE）

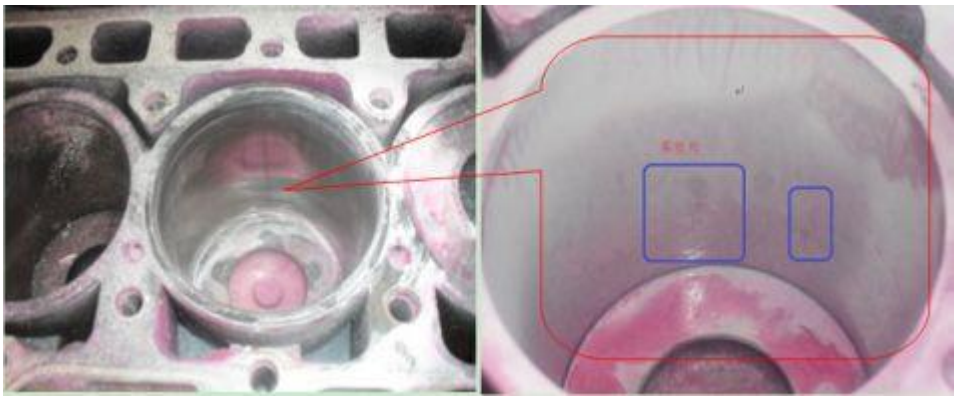
3.8 Replace the pump. If the fault is not solved, proceed to the next step.

（from Ailisheng MACHINE SERVICE）

3.9 Adjust injection timing. If the fault is not solved, proceed to the next step.

（from Ailisheng MACHINE SERVICE）

3.10 Check the cylinder body and head for cracks and damage.



（from Ailisheng MACHINE SERVICE）

Ⅰ.How to Maintain an Engine Cooling System of Ailisheng MACHINE?

Cooling System Impurities

After long time running, the cooling system may be affected by many types of dirt formed inside it. The type of dirt varies according to use and maintenance conditions of the cooling system. For example, as most engineering vehicles usually use water, the dirt formed inside the cooling system is mainly incrustation. However, for vehicles which always use antifreeze, the main impurity formed inside the cooling system may be gel-based dirt.

For **Ailisheng loader** and **Ailisheng excavator**,other types of impurities inside the cooling system may include: ① degraded anticorrosive agents, oxidized ethylene or propylene glycol ② heavy metals ③ hard water impurities ④ physical impurities ⑤ electrolyte

Major Faults of the Engine Cooling System

1. The water temperature of the engine is too high
2. The water temperature of the engine is too low
3. Cooling system leak

There are many reasons for engine overheating. The most common one is that the impurities formed inside the cooling system, like incrustation scale and gel-based dirt, block the waterway and thus affect the cooling effect.

Cooling system leak usually refers to the leak occurs in the water tank, water pipe and cylinder head gasket.

Solutions provided by Ailisheng machine company:

1. Solution to High Temperature Problem

Cooling system cleaning agent together with special equipment can help solve engine overheating problem caused by dirt accumulation.

(1) How to choose the cleaning agent?

① Acidic cleaning agent is ideal for most sediments

② If the gel is not hard, you can also use alkaline or non-corrosive cleaning agent, in addition to acidic cleaning agent

③ Removing oily impurities requires acidic cleaning agent.

(2) Handling Method

Connect the special equipment to the vehicle, and put the cleaning agent to the engine cooling system. After it works under the normal operating temperature for 30 minutes, replace the old antifreeze through the equipment.

2. Solution to Cooling System Leak

(1) Leak Analysis

Water tank leak is mainly in the form of granule and strip. Water pipe leak is a problem usually resulting from crazing and aging, in addition to damages.

(2) Handling Method (**Ailisheng Suggestion**)

By using plugging agents, water tank leak problem can be completely solved. The plugging agent, a chemical substance similar to a bulking agent, is capable of plugging all leaky parts.

ⅡHow to check the Ailisheng Loader Hydraulic Torque Converter Oil Temperature Analysis

Ultra high oil temperature of a loader torque converter may cause many problems, such as oxidizing oil, reducing viscosity, decreasing transmission and lubrication functions, accelerating leak and parts abrasion, etc.

There are many different reasons that can cause high oil temperature of a torque converter, typically: unqualified hydraulic transmission oil, blocked filter, faulty rotary oil seal, loose connecting bolts, and cooling system fault.

How to Prevent Ultra High Oil Temperature of a Ailisheng Loader Torque Converter?

1. Select and Use the Right Hydraulic Transmission Oil

Choose the hydraulic transmission oil according to the temperature characteristics of the actual construction season. In addition, the oil should be oxidation resista nt, with certain viscosity.

2. Pay Attention to Maintenance

Keep the filter screen unblocked. Regularly check the oil filter if the **Ailisheng** wheel loader is equipped with it. The output shaft seals of the front and rear axles should also be inspected so as to prevent oil leak. Additionally, regular checks of the engine cooling water quantity and tensioning of fan belt are required to ensure there is enough cooling water and air.

3. Give Much Attention to Degree of Parts Wear and Assembly Quality

a. Keep the variable speed pump operating at peak performance. If the temperature of the pump is much higher than that of the tank, then an overhaul is required. The clearance between the pump cover and two gear faces should be 0.150～0.200mm, and the maximum width difference of a pair of gears should be less than 30mm. There should be no obvious scratches and grooves on the parts surface. The gears must be assembled in pairs and run flexibly.

b. During transmission overhaul on **Ailisheng wheel loader**, please focus on checking friction plate. There should be no spalling, cracks, debris or dust, and the friction plate and the steel sheet must be bonded firmly.

c.Maintain proper fit clearance of the speed change valve. If the clearance is too large, the pressure oil may be squeezed from the gap, which may cause throttle loss, resulting in high oil temperature. In addition, the pressure of the speed change valve should be properly adjusted.

d. After installation of the torque converter, all rotating parts should be able to rotate freely. Rotate the turbine set by hand, the first stage turbine blade and the second turbine blade should rotate flexibly and freely without clamping stagnation. Additionally, oil seals and seal rings should be damage free. Also, bearing failure

must be eliminated. Furthermore, maintain normal oil pressure at the inlet and outlet of the torque converter
e. Avoid long-term overloaded operations.

Ⅲ How to maintain the Ailisheng Excavator Battery

(1) Maintain a High Electrolyte Level
According to operating requirements, the electrolyte level should be 10-15mm higher than pole plate. In order to check this, you can insert a 150mm long glass tube (inner diameter: 4～6mm) vertically into the filling opening until it is in contact with top edge of the pole plate, then press the upper opening of the glass tube with your index finger and take the tube out with your thumb and ring finger. The electrolyte height in the glass tube is the exact height you need. If this height is less than 10mm, you'd better add a certain amount of distilled water timely. Please don't add any liquid like spring water, river water and tap water, as well as dilute sulphuric acid.
(2) Clean the Yellow-White Pasty Mass off the Battery Shell
The yellow-white pasty mass on the battery shell is caused due to electrochemical corrosion of electrode pole around which the sulfuric acid is splashed. The white mass is lead sulfate, and the yellow mass is ferric sulfate. The strong corrosiveness and great electric resistance may result in poor conductivity of the battery. To avoid this, **Ailisheng** suggest that you can use cotton yarn (which has been immersed in alkaline water or soda water) to clean off the splashed electrolyte. If there is any oxide in the gap between the pole and the conductor joint, please scrape it off.
(3)Periodic Boost Charge

Generally, the storage battery should be charged within 24 hours if it is flat; for unused machines, 1 time boost charge of their battery is required every month; 1 time boost charge of the battery which is in use is required every two month. (4) Regularly Inspect the Density of Electrolyte
Electrolyte density should be in accordance with the specific season and other conditions. For example, the density of electrolyte is relatively higher in winter.

Ⅳ How to maintain Hydraulic Cylinder for Ailisheng wheel loader and Ailisheng excavator

During the maintenance of engineering vehicles, we usually detect that there are some cellular cavities inside the hydraulic cylinder or at the surface of piston, piston rod. These cavities are caused by cavitation corrosion. Hydraulic cylinder cavitation could lead to burning of bearing rings and seal rings, and finally result in cylinder leak. In addition, cavitation, coupled with other types of corrosion, will greatly accelerate the corrosion of main hydraulic cylinder parts, thus significantly affecting the operation of the engineering vehicles like **Ailisheng road rollers,Ailisheng loaders, and Ailisheng excavators.**

1. What Causes Cavitation?

(1) Analysis of Cavitation
Cavitation is the formation of vapor bubbles of a liquid in a region where the pressure of the liquid falls below its vapor pressure. When the cavitation bubbles collapse, they force energetic liqu
id into very small volumes, thus creating spots of high temperature and emitting shock waves. The highly localized collapses can produce great wear on components of hydraulic cylinders.
(2) Cavitation Caused by Unqualified Hydraulic Oil
High quality hydraulic oil can effectively prevent cavitation. Bubbles can be easily formed in oil with poor antifoaming ability, thereby resulting in cavitation. In addition, if the frequency of oil pressure change is too high, air bubble formation and collapse can also be largely accelerated. Moreover, overheated oil will also increase the possibility of cavitation.
(3) Cavitation Due to Improper Manufacture and Maintenance
In the assembly or maintenance, air in hydraulic system is not discharged, which could cause cavitation under high temperature, high pressure conditions.
(4) Cavitation Resulting from Poor Quality Coolant
The coolant which contains corrosive medium like acid radical cation and oxidant is liable to chemical, electrochemical corrosion, thereby accelerating the speed of cavitation.

2. How to Prevent Cavitation?
Although there are many factors could cause cavitation, cavitation can also be avoided if we take effective measures to prevent it. The following experience is from **Ailisheng machine** service team:
(1) Use High Quality Hydraulic Oil
Choose high quality hydraulic oil according to the related oil standard, because qualified oil can effectively prevent the formation of air bubble. Keep the hydraulic system as clean as possible, and regularly inspect the oil quality, oil level and oil color. Whenever water bubbles or foams occur in the hydraulic oil, please work to find the air source and then eliminate it.
(2) Prevent the Oil Temperature from Being too High so as to Reduce Hydraulic Shock
Reasonable design of the cooling system is key to maintaining normal temperature of hydraulic oil. In addition, **Ailisheng company** remind
that ,smoothly operate hydraulic joystick, distribution valve and thrust lever, in order to minimize hydraulic oil's impact on the hydraulic components. Furthermore, timely maintain the cooling system so as to keep its temperature within certain boundaries, thus reducing the energy caused by the collapse of air bubbles.
(3) Maintain the Normal Clearance between Joint Surfaces of Hydraulic Components
When manufacture or repair main components of the hydraulic cylinder (like cylinder block, piston rod), please assemble them according to the lower tolerance limit of mounting dimensions, which can greatly reduce cavitation. If cavitation

occurs in hydraulic components, utilize metallographic sandpaper polishing technique to remove cavitation pitting and surface carbon deposit.
(4) Pay Attention to Air Discharge during Maintenance
This is very important experience from **Ailisheng** service team. After maintenance, the hydraulic system should be operated for a while so that the hydraulic oil in the system can fully circulate. If necessary, disassemble the oil inlet pipe or return pipe so as to let the oil spill out of it, thus achieving air discharge of single cylinder.

Ⅴ Holes Shouldn't Be Blocked

Some "holes" in the Ailisheng construction machinery shouldn't be blocked, for example:
(1) Pump spill hole and drainage hole. The pump shaft is designed with a spill hole which can detect whether there is a leak in the pump and discharge the water leaked from the pump through it. If this hole is blocked, then the water leaked will enter the pump bearing to affect lubrication, resulting in damage to bearing and pump shaft. When the drainage pump is not operating, the drainage hole can be used to drain the retained water out of the shell. If this hole is blocked, the cooling water left in the pump will damage the water seal.
(2) The oil drain hole in the diesel oil transfer pump can directly drain off the leaked diesel oil from the pump. When this hole is blocked, the diesel oil left in the transfer pump will enter the oil pan of the injection pump to dilute lubricating oil, causing oil deterioration, thus damage on **Ailisheng heavy equipment.**
(3) The diesel engine is difficult to start if the 2mm conical nozzle in the cylinder head is obstructed.
(4) Once the oil return hole of the diesel engine injector is blocked, redundant diesel oil can not return to the fuel tank. This may cause the pressure in the oil return duct and injector increases, and consequently, change oil injection time.
(5) The vent hole in the fuel tank cap is used to prevent the formation of a vacuum as the oil level decreases, thus ensuring the normal oil supply.
(6) The vent hole in the oil filter cap can discharge waste gas out of the crankcase. The blockage of this hole will lead to oil leakage and oxidation deterioration, which will affect the performace of **Ailisheng machine**s
(7) The diesel engine lubricating hole, through which the rocker arm, rocker shaft and valve push rod are lubricated, will significantly accelerate the wear of mechanical parts if it is obstructed.
(8) The dust discharge hole in the air filter can discharge dust particles. If this hole is blocked, the dust may enter into the next filtration device or even the cylinder, thereby accelerating mechanical parts wear.
(9) There are many oil return holes in the piston ring groove of the diesel engine, through which the excess oil scraped off cylinder walls can flow back into the crankcase. Blockage of these holes will make a large amount of oil enter into the combustion chamber and then cause oil burning, which will be harmful for the **Ailisheng heavy equipments**.
(10) The drainage holes in the engine oil cooler and water radiator are intended to

drain the cooling water out of each part. If these holes are blocked, especially in winter, the cooling water will freeze and thus damage the oil cooler and water radiator.

(11) The vent hole in the auxiliary water radiator cap of diesel engine. The formation of pressure difference between the main radiator and auxiliary radiator will be influenced if this hole is blocked, which could hinder the cooling liquid in the auxiliary radiator from flowing back into the main radiator, thus greatly affecting the cooling effect.

(12) The holes in the hydraulic oil tank, transmission and torque converter etc. are designed to balance the internal pressure within the tank and discharge high temperature gas so as to prevent the temperature from rising rapidly and oil deterioration. This should be paid more attention on the **Ailisheng construction machines.**

(13) The vent holes in the main reducing gear shell are used to prevent high oil temperature and high air pressure in the shell, thus effectively protecting the seals from being damaged.

(14) The vent hole, oil return hole and compensation hole in the cover of the brake master cylinder ensure supplement and backflow of the braking fluid. Blockage of these holes may cause braking problems and cylinder oil leak.

(15) The small holes in the main clutch and steering clutch are responsible for promptly removing oily d oily dirt from these clutches. If these holes are obstructed, the oily dirt will enter the friction plate surface and thus cause problems such as clutch slippage.

The above is collected from **Ailisheng machine** service team, which keep concern about the customers of **Ailisheng wheel loader**, **Ailisheng forklift loader, Ailisheng log loader**, **Ailisheng excavator**, etc.

I. What is called as early abrasion of the cylinder jacket in Ailisheng construction equipment? What are the causes for the early abrasion of the cylinder jacket in Ailisheng heavy machinery? How can this be prevent in Ailisheng construction machinery?

The phenomenon that the cylinder jacket is soon abraded or slot cut is called as early abrasion. The causes are usually as follows:

1. The places where the diesel is used are often very sandy. The climate conditions are very severe like the northwest of China. The air filter with superior filtration effect shall be used.
2. The surface of the piston is too rough or the flexibility of the piston ring set is too strong. Design or select piston with relatively high roughness and piston ring with modest flexibility.
3. The mark and specification of the engine oil used is in correct, or the oil is too watery or too dense, or the oil pressure is insufficient to cause the failure of the cylinder jacket obtaining good lubrication. Use the engine oil with the mark specified in the instruction manual provided by the manufacturer of the diesel.
4. During the engine oil filling, dust or impurities may be mixed into the oil sump of the

combustion motor. Improve the method for **Ailisheng construction machinery** oil filling to avoid the mixing of the dust or impurities into the oil sump.

5. The function of the air filter on **Ailisheng construction equipment** is not good to cause much dust to be absorbed into the cylinder with air, reflecting a bad filtration effect, which will accelerate the abrasion of the cylinder jacket. Select filter with good filtration effect or strengthen the filtration effect. The secondary filtration can be adopted, i.e. connecting to oil batch filter or paper filter.

6. During the grinding of the cylinder jacket, the roughness fails to reach the standard. Improve the machining process and machine according to the standard process.

7. The axial clearance of the crank shaft is too big to cause the shift of the crank shaft in the front and the back. Check the axial clearance of the crank shaft. Replace the front and back thrust bearing when necessary.

8. The on-load operation is immediately carried out after cold start. The normal working temperature cannot be maintained within a long period. Change the operating method, and gradually improve the rotating speed and increase the load.

9. The engine oil filter is too dirty and maintenance and cleaning are not timely carried out. Replace the cleaner insert part according to the requirement of the instruction manual.

10. The rotating speed of the diesel is not stable. Check the speed controller of the oil pump to make the speed stable.

11. After the air filter is used to certain degree, it will send signals to request quick dust removal and maintenance, but the filter element is not timely replaced and so on. The air filter adopted by our company has two filter elements and three structures. Cylinder 4, 6, and 12 natural suction diesel adopts inertia oil-batch air filter with steel wool filter element; the boosting diesel adopts K2442XF-1 cyclone paper air filter. There is an intake resistance indicator set on K2442XF-1 air filter. When the window of the indicator turns from yellow to red and the arrow indicates 7.5kpa vacuum degree, it shows it is necessary to remove the dust and maintain this filter quickly. After maintenance, press the upper part of the indicator to reset the mark of the indicator.

As for the inertia oil-bath air filter with the steel wool filter element and without resistance indicator, it is usually cleaned every 100 hours it is operated. The interval shall be properly increased or decreased according to the concentration of the dust in the environment. During the cleaning, take out the steel wool and put it in the gasoline to clean. Also, use compress air to blow it clean. Meanwhile, clean the oil pool of the filter and then add proper amount of new engine oil. When the resistance indicator of K2442XF-1 cyclone paper air filter does not work, the air filter can still be taken out. However, the dust accumulated in the dust collection case shall be cleaned every 100 hours it is operated. Take it out every 100 to 250 hours. Gently strike the end face of the filter element or blow from the inner cavity of the filter element by using compressed air with the pressure not greater than 490kpa. Also, you can use brush to gently brush the stained surface.

However, it is strictly forbidden to use oil or water to cleaner. If it is found that the filter element is damaged or the dirt is too much to clean, replace it.

II. How deal with the ignition of the engine is not in good condition, and the rotating speed is not stable on the Ailisheng construction machinery?

1. Air enters the fuel system: find out the place where the air enters the fuel system and fix it. Loosen the air bleeder on the injection pump or the connecting pipe of the fuel injector. Tightly lock the connecting pipe. Use hand to open the pump to eliminate the air in the fuel system. If it cannot be eliminated still, start the engine under the abovementioned condition.
2. Low fuel pressure: check the oil tank to see if there is oil and if there is oil leakage, serious deformation, bending, and dirt in each oil pipe. Also, check if there is any bubble inside the pipe. Check the fuel delivery pump to see if it is damaged. During the high-speed full-load operation of the fuel oil pump, the pressure of the inner cavity shall not be lower than 105KPa. Otherwise, it shall be repaired.
3. Damage of injection pump or oil injector: the cylinder shutdown testing method can be adopted to eliminate the problem. The method is as follows: under the condition that the position of the operation handle of the diesel is not changed, loosen the high-pressure oil pipe of each cylinder one by one. If a cylinder is not changed, it shows that the injection pump or oil injector of this cylinder is damaged. It is necessary to replace or repair.
4. The injection timing is incorrect. Re-adjust according to the correct method.
5. The push rod is bended or damaged. Replace it.
6. The valve clearance is incorrect. If the change of the valve clearance is obvious, check the rocker arm, push rod, valve, valve retainer, cam shaft to see if they have abnormal abrasion. Replace or repair them according to specific conditions.

The speed controller is faulty.

III. How to deal with the oil consumption is too much in Ailisheng construction machinery?

1. The injection timing is incorrect. Adjust it according to different models of the diesel.
2. There is oil leakage in the fuel system. Check the fuel pipes.
3. The fuel temperature is super unsatisfactory. Correct the temperature as required.
4. The temperature of the engine oil is too low. Improve the temperature of the engine oil.
5. The piston ring and cylinder jacket is seriously abraded to cause severe air leakage. Repair or replace relevant components.
6. The combustion is abnormal. The orifice of the oil injector is blocked, and the injection pressure is low. The plane distance of the oil injector extending to the cylinder cover does not conform to the ex-factory requirements. Check the oil injector and replace or repair it according to the condition.
7. The distribution phase is incorrect. Calibrate the distribution phase. Repair or replace

relevant components according to the calibration result.

8. The air filter is blocked. Clean the filter element or replace it.

9. The valve clearance does not conform to the assembly requirement. Check the abrasion of each component of the distribution system. Repair or replace the components.

10. The air storage clearance is incorrect. Check the air storage and adjust or replace the cylinder gasket.

11. There is oil leakage in the fuel system. Check the fuel delivery pump, plunger and barrel assembly, and delivery valve couple. Repair or replace according to the abrasion condition.

IV. What are the causes contributing to the low engine oil pressure, and how can they be eliminated in Ailisheng construction equipment?

The working pressure of the diesel is usually around 100-500KPa. If the cause of the failure is not timely found out and the failure is not timely eliminated, semi-dry friction or dry friction will be caused between friction pairs. If the problem is serious, the bearing bush and cylinder jacket can be geared. Reasons to cause very low oil pressure include:

1. The engine oil is insufficient in the oil sump. The solution is to fill the engine oil to the specified requirements.

2. The mark of engine oil is incorrect. Since the viscosity of the engine oil of different marks varies to influence the pressure of the engine oil, the user must select and use engine oil according to the requirement of the instruction manual.

3. The oil way is blocked, and thus the engine oil cannot enter the main oil way.

4. The coarse filter screen in the oil sump is locally blocked due to dirty oil to cause the insufficiency of the oil absorption amount of the oil pump so as to lead to the insufficiency of the pressure of the engine oil. The solution is to clean the coarse filter screen.

5. The nut of the oil absorption pipe in the oil sump is not tightened and thus the air is leaking. Therefore, the pressure of the engine oil is not enough due to the air suction during the operation of the diesel. Tighten the nut to solve this problem.

6. The oil pump is abraded. Replace the abrasion part.

7. The startup pressure of the oil return valve is too low after regulation to cause the untimely oil return, thus influencing the engine oil pressure of the whole lubricating system. Adjust the pressure of oil return valve.

8. The filter element of the engine oil filter is blocked, and the safety valve also does not work at the same time. Therefore, the engine oil cannot enter the main oil way. Clean or replace the filter element.

9. The pressure-limiting valve of the oil pump is abraded, the spring is deformed, and the matching of the intercepter valve and the seat is not tight, all of which can make the engine oil return to the oil sump. The oil supply is thus insufficient in the oil pump to cause the reduction of

the pressure of the engine oil. Replace relevant abrasion parts to solve the problem.

10. The matching clearance between lubricating parts is too big. The abrasion of the main bearing of the crank shaft and the bearing of the connecting rod can especially cause the oversize of the bearing clearance. Thus, the leakage of the engine oil is increased, and the pressures of the main oil way and engine oil are reduced. Adjust the matching clearance.

11. There is serious oil leakage in the front and back oil seals of the crank shaft or the choke plug screw of the main oil way as well as the oil pipe joint to cause the sharply loss of engine oil and the reduction of the oil pressure in the main oil way. Replace or repair relevant components.

12. The measuring instrument is incorrect. Replace the instrument.

13. The matching clearance between the piston of the diesel and the cylinder jacket is too big to cause serious air leakage, heating of the engine oil of the oil sump, temperature rise, viscosity dilution and relatively low pressure.

14. There is diesel oil mixed in the engine oil, but the operation of the engine is normal. Disassemble the fuel delivery pump and the core seal. Replace the leaking fuel delivery pump and engine oil.

15. The diesel oil enters the engine oil, the engine power is reduced, and the oil pressure is reduced. Check the fuel spray nozzle to see if it is clamped or seized. Replace it with a new fuel spray nozzle.

16. The temperature of the cooling liquid of the engine exceeds the normal 100℃ to cause the reduction of the oil viscosity. Refer to the failure eliminating procedures for temperature of the cooling liquid exceeding the normal value.

V. Why is the pressure of engine oil too high, and how can it be solved in Ailisheng wheel loader?

The normal engine oil pressure is usually kept between 100 to 500KPa during the operation of the diesel. Good lubricating effect cannot be obtained if the pressure of the engine oil is too high or too low. The reasons why the oil pressure is too high generally include the following points:

1. The startup pressure of the pressure-regulating valve of the fuel pump is too high, and the oil returned is not sufficient under a normal rotating speed; the oil amount entering the main oil way increases to cause the rise of the pressure of the engine oil. Adjust the pressure-regulating valve of the oil pump. The method is to use wrench to unscrew the lock nut of the regulating screw of the pressure-limiting valve. Use the screwdriver to unscrew some regulating screws to reduce the spring pressure and reduce the oil pressure of the main oil way to the regulated value. After adjustment, re-tighten the lock nut.
2. The mark of the engine oil does not conform to the requirement and the viscosity is too big, or the viscosity is increased since the temperature of the engine oil is relatively low to raise the oil pressure of the main oil way.

3. The pressure gage of the engine oil is out of work and the measurement is not precise.
4. The oil return valve on the engine oil filter is blocked to make the excessive engine oil incapable of returning to the oil sump during the operation of the diesel to cause the sharply increase of the oil pressure.
5. The safety valve is not tight or the the opening pressure is low to make part of the engine oil enters the mail oil way without filtration, thus increasing the pressure of the main oil way so as to increase the pressure of the engine oil.
6. The assembly clearance between the main bearing of the crank shaft and the bearing of the connecting rod is too small, or the oil way is locally blocked. At this point, the pressure of the engine oil is increased, and the temperature of the oil also becomes too high. The assembly clearance must conform to relevant requirements.
7. The operational temperature of the engine is too low. Check the effluent temperature to see if it is too low. Improve its temperature and turn down the water inlet amount.

VI. If the engine oil consumption is too much in Ailisheng construction machine. How can this problem be solved?

1. Oil leakage at the outer surface: check the locking condition of the each pipe and bolt of the engine oil pipeline. If it is found that the screw is loose, the gasket is damaged, and the pipe is broken, tighten the screw or bolt and replace the gasket and pipe respectively.
2. The oil filled in the crank case is too much. The engine can only be started after marking between “L (low oil level) and H (high oil level)” according to the oil gauge. If the oil level is lower than L, or higher than H, the engine shall not be started. The engine can be operated and handled if the oil level is between L and H.
3. The quality of the engine oil is not good or the mark is incorrect. Select and use the engine oil mark according to the engine oil mark or oil replacement period specified in various series of diesels of our company according to the chart.
4. There is oil leakage in the engine oil cooler. Check if there is engine oil in the cooling water. Replace the core of the engine oil controller.
5. Engine oil on the air compressor pump: since all the air compressors are introduced with a little amount of engine oil to lubricate the piston ring and moving parts. When this kind of engine oil is used for a certain period of time under the normal operation temperature of the air compressor, the gum deposit or carbon deposit will be generated. Therefore, it shall be checked. Replace it or eliminate the carbon deposit when necessary; carefully check the unloading valve to see if there is any carbon deposit. If the carbon deposit is serious, eliminate and clean. Also, check the cylinder end of the air compressor and the intake and outlet valves. Replace relevant parts when necessary. If the unloading valve is clean or there is slight carbon deposit, install new O ring on the body of the unloading valve and install new Y sealing ring in the hole of the unloading valve.

6. The air leakage amount of the crank case is big to make the engine oil jump out of the air port. Check the track for the loss of engine oil in the breather pipe. Check oil-gas separator and measure the air leakage amount. If the leakage amount exceeds 12 times of the displacement of the cylinder, check the abrasion of the cylinder jacket of the piston ring. Replace or repair when necessary.
7. The oil leaked from the turbocharger enters to the air intake or outlet pipe. The diesel is at the low-load operating status for a long term; the flexible sealing ring of the turbocharger loses its flexibility or is over-abraded. Properly improve the rotating speed load; replace the flexible sealing ring.
8. The sealing ring of the valve stem is abraded. Replace it.
9. The sealing of the piston ring is out of work. Replace it.

VII. What are the causes for the rise of the engine oil level of the oil sump and what solutions are available?

1. The water seal ring of the cylinder jacket is damaged. Replace it.
2. There is water leakage in the faying face of the cylinder jacket and the engine body. Check the faying face between the shoulder of the cylinder jacket and the engine body to see if it is flat. The red copper gasket is damaged. Replace the gasket.
3. The inner cavity of the cylinder jacket is corroded and perforated to cause water leakage. Replace the cylinder jacket.
4. The gasket of the cylinder cover is damaged. Replace the gasket.
5. The core of the water-cooling engine oil cooler is damaged. The engine oil and the cooling water are mixed to flow to the oil sump together. Replace the core of the cooler or weld up the core.
6. There is water leakage in the fresh water pump shaft and the sealing ring. Overhaul or replace the water seal ring, and grind the sealing face.
7. The water seal rubber ring of the fresh water pump is damaged. Replace it.
8. The wall of the water cavity of the engine body cavitate to have water leaking (especially the wall of cylinder against the push rod). Carefully weld up or fill the cavitated hole. However, the mating surface shall not be damaged or deformed. If the corrosion is serious, replace the engine body.
9. The cylinder cover has cracks. Replace it.
10. The fuel delivery pump is damaged. For example, the abrasion of the piston or the check valve makes the diesel oil leaking in the oil sump. Replace the damaged components.
11. There is leakage between the plunger guide bush of the injection pump and the locating ledge of the body of the injection pump. Replace.

VIII. When the blue smoke is emitted during the exhausting? Solution

1. There is too much engine oil inside the oil receiver of the air filter. The airflow of the intake air takes the engine oil to the combustion room (oil-bath air filter). Reduce the engine oil to the required level.
2. The piston ring is clamped or there is too much abrasion and insufficient flexibility. During the installation, reversely install the chamfer of the piston ring to let the engine oil enter the combustion room. Disassemble and check the piston ring. Replace it when necessary.
3. During the long-term low-load (under 40% of the rated power) operation, the clearance between the piston and cylinder jacket is relatively big to make the engine oil easily whisk into the combustion room. Properly improve the load; during mating, the power shall be properly selected. Determine the clearance between the cylinder jacket and the piston. If the over-proof is relatively big, replace the cylinder jacket.
4. Too much engine oil is added in the oil sump to cause the big end to make the excessive oil flow to the cylinder wall so as to lead to serious oiling of the cylinder. Fill the engine oil according to the engine oil staff.
5. The piston deviates inside the cylinder jacket due to the bending and deformation of the connecting rod so as to cause the engine oil whisk into the combustion room.
6. Several openings of the piston ring are almost geared, thus creating conditions for lubricating oil carry-over. Calibrate the connecting rod. During the assembly, please diverge the piston ring according to the equal angles.

IX. Why is easy to have the water in the tank boiled? What is the solution?

1. The water volume inside the tank is insufficient. Fill up the water.
2. The transmission belt of the cooling fan is too loose or the belt is damaged. Adjust the looseness of the transmission belt according to the requirement of the instruction manual; replace the belt.
3. The fuel injection advance angle is lagged too much to cause the excessive heat transmitted to the cooling water so as to raise the water temperature much. Adjust the fuel injection advance angle.
4. The gap between the cooling fins of the tank is blocked by dirt to influence ventilation. Eliminate the dirt.
5. The thermostat is out of work. Replace it.
6. Abundant scale deposits are accumulated in the tank or the water channel to cause the blockage of the water channel or the freezing of the radiator. The water channel is blocked to

make the water flow incapable of cycling. Eliminate the scale deposits and use soft water.

7. The cooling water pump impeller and the pump shaft are loose, the bond is cut off, or the impeller is damaged, thus the water absorption capacity is reduced to even zero, i.e., no water absorption. Check the connection between the water pump impeller and the pump shaft. If they are damaged, replace the damaged components.

X. Why the temperature of the cooling liquid is too high (gradually overheating)? What is the eliminating method?

1. Low cooling liquid level. Open the filler cap of the radiator or the expansion tank or the choke plug of the inspection port of the liquid level. Check the cooling liquid level, but the following points shall be paid attention to: the filler cap of the radiator or the expansion tank or the choke plug of the inspection port of the liquid level can only be opened when the cooling temperature inside the diesel is reduced to 50℃. Immediately unscrew it once the diesel is stopped. The high-temperature water and steam with pressure will be sprayed out to cause injuries. The filler cap of the radiator or the expansion tank or the choke plug of the inspection port of the liquid level shall be slowly unscrewed to gradually reduce the pressure of the cooling system.

Antifreeze solution shall be added in the cooling liquid of the diesel. However, they shall be mixed before being injected into the diesel, for the heat transfer capacity of the antifreeze solution is different from that of the water. If they are directly injected into the diesel, overheating of the diesel will be caused before the mixing of these two liquids.

As for the intercooled diesel, the air bleeder on the intake intercooler shall be opened during the injection of cooling liquid so as to eliminate the air in the cooling liquid channel. Also, it is necessary to slowly inject the cooling liquid to prevent the generation of air resistance. Wait for 2 to 3 minutes to make the air fully discharged.

2. The radiator and the cooling fin of the intake intercooler are blocked or damaged. Incorrect or invalid pressure head will make the cooling liquid over consumed and the overheating of the diesel. When the air enters the cooling system, the pressure will rise to open the pressure head so as to increase the consumption of the cooling liquid, lower the liquid level and gradually raise the water temperature. The leakage of the gasket of the cylinder cover makes the gas enters the cooling system, which will also make the water temperature rise; if the air or gas entering the cooling system cannot be discharged timely, it will return to the inlet of the water pump with the cooling liquid so as to reduce the flow of the water pump and make the outlet temperature of the diesel rise.

3. The amount of air flowing to the radiator is insufficient or blocked. The cooling fin of the radiator is blocked, and the high-temperature cooling liquid flows past the radiator and is cooled. If the cooling fin of the radiator is blocked by garbage outside (paper, straw, leaf, dust, etc.), the heat dissipation effect will be influenced. The compressed air with the pressure around 550kpa shall be used to blow the garbage on the cooling fin away.

The automatic tension device is damaged, to cause the slipping of drive belt, lower the rotating speed of the fan, and reduce the air flow, so as to affect the cooling effect. Check the tension pulley and the transmission bearing of the fan. Sufficient tensioning force shall be guaranteed. When the fan fitted with silicone oil clutch becomes invalid, the rotating speed of the fan cannot be changed according to the change of the air temperature of the radiator. If the

temperature of the fan is too high while the rotating speed of the fan cannot follow, the overheating of the diesel will be caused.

4. The water pump or the drive belt of the fan is loose. Tighten them.

5. The radiator hose becomes shrunken after suction, blocked or leaking. Check the hose and replace if necessary.

6. The oil level of the engine oil is incorrect. Add or discharge the engine oil.

7. The cooling fan and wind scooper are damaged or the fan is separated. Check the wind scooper, and repair, replace or reinstall it.

8. The pressure head of the radiator is incorrect or faulty. Check and verify the pressure difference of the radiator. When the pressure difference is 14KPa, the base shall be set and the sealing shall be guaranteed.

9. The concentration of the antifreeze liquid is too big. The proportion rate of the antifreeze liquid is generally recommended as 50:50 (water: ethylene glycol). When the proportion of water and ethylene glycol is 32:68, the freezing point is reduced to the lowest value (i.e. the antifreeze capacity of the antifreeze liquid reaches the maximum). Under no condition shall the proportion of ethylene glycol exceed this value. If this value is exceeded, the freezing point will rise instead. Also, if the concentration of ethylene glycol is too high, scales will be easily generated on the surface of the component of the cooling system. Also, the radiator will be blocked and there will be leakage in the sealing ring of the water pump. Meanwhile, if the proportion of the ethylene glycol is too high, the heat conduction capacity of the cooling liquid will be reduced. Add water to dilute the excessive concentration.

10. The water temperature sensor or the water temperature gage is damaged. Check the water temperature sensor and the water temperature gage. Repair or replace if required.

11. The thermosistor is incorrect. It is not precisely installed or it is damaged. The diesel cannot be operated without thermosistor. If it is not installed, the resistance of the bypass channel is small. The cooling liquid flows to the inlet of the water pump directly via this channel, which will cause the overheating of the diesel. If the thermostat opening temperature is too high, it will also cause the overheating of the diesel. Therefore, the thermosistor shall be checked. It shall be repaired or replaced if it is damaged.

12. The radiator shutter is not fully opened or the wind shield of the radiator is closed in cold days. Check the shutter and repair or replace it if necessary. Open the wind shield of the radiator.

13. The air or burning gas enters the cooling system. Check if there is any air leakage in the clamp of the water inlet hose of the pump; check the gasket of the cylinder to see if it is damaged to let the burning gas or compressed air enter the cooling system. Repair or replace.

14. The water pump is faulty. The water pump is driven by belt pulley of the crank shaft via the drive belt. The automatic locking device is adopted to prevent the slipping of belt pulley of the water pump. If the locking device is out of work, the rotating speed of the water pump will be reduced, and the flow is cut off. Replace the water pump.

15. The water channels of the radiator, cylinder cover, gasket of the cylinder cover and the cylinder body are blocked. Dredge the water channel of the cooling system and inject new cooling liquid.

16. There is too much oil in the injection pump. Check the injection pump and regulate the oil amount to the value specified in the instruction manual.

17. There is problem in the design of the vehicle or the cooling system of the equipment.

Contact with the vehicle or equipment manufacturer to improve the fan, radiator and other elements of the cooling system/

18. There is crack in the shoulder of the cylinder jacket; at this point, there is rolling of cooling water inside the radiator. Replace the cylinder jacket.

XI. Why is the cooling liquid consumed too much, and what is the solution?

1. There is water leakage outside the engine. Check the sealing or gasket of the engine and component and the water leaking place of the water discharging switch. Replace the gasket and tighten the switch.
2. There is water leakage in the water tank or the heater of the driver's cab. Check the radiator, heater hose and its joint to find where the water is leaking. Then replace or tighten it.
3. Overheating or leakage of compressed air to cause the overflow of the water tank.
4. There is water leakage in the engine oil cooler of the reduction gearbox. Check if the cooling liquid is mixed with the engine oil of the reduction gearbox.
5. There is water leakage in the cylinder cover or gasket of the cover of the water-cooled air compressor. Check if there is any cooling liquid in the engine oil. Replace the gasket.
6. There is water leakage in the pressure-boosting engine and intercooler. Replace the intercooler.
7. There is water leakage in the gasket of the cylinder cover. Replace the gasket.
8. There is water leakage in the water seal ring of the cylinder cover. Disassemble the oil sump of the cylinder jacket to check if the water seal ring of the cylinder is leaking. If yes, replace the ring and disassemble the cylinder jacket to check the ring.
9. The cylinder cover is cracked or the water seal is leaking. Replace the cylinder cover or water seal.
10. The cooling water channel of the engine body is leaking. Replace or repair the engine body.

XII. Why is the temperature of the cooling liquid too low and what is the solution?

1. There is too much air flowing past the radiator. Check the fan clutch and the fan itself as required and refer to the instruction manual provided by the manufacturer.
2. The radiator shutter is clamped at the maximum opening. Control the air volume flowing past the radiator by adjusting the opening of the shutter. If the adjustment of the shutter fails, the temperature of the cooling liquid will be too high or too low. Check the shutter to see if it is flexible. Repair if it is not flexible when opening or closing. Open and close the control air pipe of the shutter to see if it is leaking.
3. The thermosistor is damaged, faulty, and incorrect or out of work. Check the thermosistor and replace it when necessary.
4. The fan is faulty. Check the fan to see if it is running continuously.
5. The temperature sensor becomes invalid. Check and calibrate the sensor and clean water outlet of the cylinder cover.

6. The thermometer is out of work. Calibrate the thermometer and replace it if necessary.

XIII. Violent vibration of the diesel

1. The engine frame is loose or damaged. Check and replace the engine frame.
2. The fan is damaged or the accessory is faulty. Replace relevant damaged component.
3. The shock absorber is faulty. Check and replace it.
4. The parts of the transmission shaft of the fan are faulty. Check and replace them.
5. The bearing of AC generator is abraded or damaged. Check and replace the AC generator.
6. The flywheel is eccentric.

(1) Concentricity of the location hole of the flywheel. Every circle the crank shaft rotates, the overall reading of the dial indicator shall not be greater than 0.20mm. Otherwise, the flywheel shall be replaced.

(2) Rotate the crank shaft for one cycle, and measure the run-out values of the four points with equal distance on the flywheel plane. Note: before the reading of each point, it is necessary to push the flywheel forward to make the crank shaft closely fling to the thrust face. The value difference measured in all four points shall not exceed 0.30mm. This value (0.30mm) is the axial run-out value allowed in the end face of the flywheel shell.

7. The moving parts are loose or damaged. Check the reasons for the damage of the crank shaft and the connecting rod as well as the imbalance of the parts. Replace them if necessary.
8. The parts of the drive system are abraded and imbalanced. Find the equipment manufacturer to check and replace them according to the requirement of the equipment manufacturer.

XIV. Black smokes of diesel engine emissions

1. The diesel engine load exceeds the provisions. Reduce the load and make it within the specified range.
2. The fuel supply of each cylinder is uneven. Adjust the injection pump.
3. Incorrect valve clearance and bad valve seals lead to valve leakage and serious combustion. Adjust valve clearance, check the seal cone, and eliminate defects.
4. The fuel injection angular advance is too small, too slow injection makes some fuel burning in the exhaust pipe. Adjust the fuel injection angular advance.
5. Insufficient air inflow. The air filter or intake pipe is blocked, and the compressor casing of turbocharger is too dirty. Clean and remove dust and contamination, and if necessary, replace the filter cartridge.
6. Evaluation parameters of the inlet and exhaust ports of cylinder head (average flow coefficient and the dispersion of average swirl ratio are too large). A cylinder head with a qualified evaluation parameters shall be exchanged for use.

7. Inspect the burning or abrasion of elastic seal ring of turbocharger, and the joint surface leakage of turbine or replace seal ring; tighten the joint surface of screws.

8. The application point of smoke controller is not well adjusted. Adjust the application point of smoke controller.

9. The air through the intercooler is blocked. Check the heat sink of the intercooler, if necessary, clean or repair it.

10. The outer distance of fuel injector beyond the cylinder head plane is too short, i.e., one gasket is excessively filled, and it shall be removed.

11. Fuel injector failure. Remove the injection nozzle and test it, and replace it if necessary.

12. The engine is too cold, i.e., the water temperature is below 60 ℃. Water inlet temperature shall be increased.

13. Excessive oil supply of fuel injection pump. Adjust fuel injection pump and check it.

14. Gaseous ring is worn and seal is failed. Replace the gaseous ring.

XV. White smokes from exhaust

1. Bad oil atomizing of fuel injector, the oil is dripping, and the injection pressure is too low. Check the injection nozzle couples, and conduct grinding or replacement. Readjust the injection pressure to the required range.

2. When the engine is just started, some individual cylinders are not burning inside (especially in winter.) Appropriately increase the speed and load, and the engine shall be running for some more time.

3. Incorrect starting procedures. According to the requirements of the manual, the engine is started based on the correct starting procedures.

4. The coolant temperature is too low so that part of the diesel cannot be ignited by fire. Increase the coolant temperature.

5. Too low inlet temperature. Turn off or turn down the shutter.

6. Poor fuel quality. The qualified fuel is used for verification, if verified true, then replace it.

7. Incorrect timing adjustment of injection pump. Adjust it to the specified value.

8. An extra gasket is installed in fuel injector. Remove the extra gasket.

9. Damaged fuel injector. Replace the injector (needle valve engaged).

10. The coolant leaks into the combustion chamber. Check the cylinder head gasket and cylinder head. If necessary, replace them.

11. Failed fuel pump. Remove the injection pump and check it, check if there is waste at the delivery valve, and promptly clear it.

XVI. Common faults of electric starter system components. Elimination method.

1. The starter motor does not rotate.

(1) Poor contact of connecting wire. Clean and wind the connector lug.

(2) Poor contact of brush. Clean the commutator surface or replace the brush.

(3) The starter motor itself is in short circuit. Repair the location being found in short-circuit.

(4) Inadequate charging or too small capacity of battery. To charge or increase the batteries in parallel, otherwise a new battery shall be replaced.

(5) Poor contact of solenoid switch contacts. Check the switch contacts and polish them with rubber.

2. The starter motor idling has no starting power:

(1) Poor contact or desoldering of brush or connector lugs. Clean the surface, weld or replace it.

(2) Bearing sleeve is worn. Replace a new one.

(3) The magnetic winding or armature winding is in partial short circuit. Identify the parts in short circuit and repair them.

(4) Singeing and poor contact of electromagnetic switch contacts. Check the switch contacts, and polish them with rubber.

(5) Inadequate charging or too small capacity of battery and too large line voltage drops of starter motor. Charge or update, increase conductor cross-section or reduce the conductor length.

3. Starter motor gear and apical tooth of flywheel ring gear or starter motor gear cannot withdraw:

(1) The centers of the starter motor and flywheel ring gear are not parallel. Reinstall the starter to eliminate the unparallel phenomenon.

(2) The electromagnetic switch contacts are burnt together. Inspect the switch contacts and file, grind and burn uneven locations level.

4. The start button is loose and starter motor continues to run.

(1) Battery switch moving contact and joint screw are burnt together. Conduct maintenance.

(2) ST614 starter motor adjusting screw is not well adjusted. Readjust it.

5. No electricity or low current of charging generator:

(1) Silicon diodes, field coil, rotor winding is in open or short circuit. Replace and repair them.

(2) The regulation voltage of regulator is lower than the battery voltage.

The regulator of charging generator shall work with the silicon rectifier charging generator in corresponding model. When the generator speed exceeds 1000r/min, the pressure shall be dropped and battery shall be charged. The charging generator regulator shall maintain output voltage within a certain range and the regulators in different specifications shall be equipped with based on the model of diesel engine.

(3) Exciting circuit is in short or open circuit. Connect the broken wires.

(4) Triangular adhesive belt is worn or tension is weak. Replace or adjust the tension force.

(5) Charging ammeter is damaged. Replace a new one.

(6) Wrong connections. Check and correct the wrong connection.

6. Instable charging current:

(1) Stain, abrasion or poor contact of carbon brush, and lack of carbon brush spring pressure. Clean the surface, weld or replace the carbon brush.

(2) Loose silicon diode press-fit. Replace the silicon diode and radiator components.

(3) Desoldering of regulator internal components or poor contact of connector lugs. Re-weld or polish them with No. 0 rubber.

(4) Loose triangular adhesive tape. Re-adjust the tension force.

(5) Line connector lug is loose. Inspect and tighten it.

7. Too high charging current, too high voltage, and hot generator

(1) Filed circuit connection or field coil is in short circuit. Repair it.

(2) Rotor winding is short-circuited and is in friction with stator. Inspect and file the touched surface with a file.

(3) Adjust too high voltage. Re-adjust it to the specified value.

(4) Emitter and collector of power tube of transistor regulator are in short circuit. Replace power tubes.

(5) The magnetizing coil of vibration-type voltage regulator is in open or short circuit and additional resistance is burn out. Repair or replace it.

8. Engine with noise:

(1) Loose or broken bearings. Replace them.

(2) The rotor touches with the stator. File the touched surface.

9. The battery can not be recharged, high current cannot be output and the pressure drop is not big, and there are white crystals (lead sulfate) on the polar.

(1) When the battery is in use, it is charged frequently relying on the charging generator installed at the diesel engine. The charging electric quantity is automatically adjusted by the generator regulator.

(2) After the battery is discharging, it shall be charged in the shortest time to avoid plate sulfation.

(3) The hole of battery injector plug shall be kept smooth, and the plug shall be unscrewed when charging and screwed on when charging is completed.

(4) The battery electrolyte level shall always be checked, generally 10 ~ 15mm higher than the top surface of polar plate. If abnormalities are found, the dilute sulfuric acid or distilled water with the proportion of 1: 400 shall be added for adjustment. Avoid adding water, well water and concentrated sulfuric acid.

(5) The charged and unused batteries shall be recharged at least once a month.

(6) Batteries shall be kept clean and exposed surface, vent hole on top of vent cover and cable joints shall be washed periodically. The cleaning fluid shall not be allowed into the battery when cleaning and debris shall be prevented going into the electrolyte.

(7) The frequent lack of battery charging, long-term use of low current discharge, and excessive discharge or no timely charging after discharge will lead to the battery plate sulfation, which is characterized by generating a lot of white lead sulfate layers on the top plate to affect normal charge-discharge performance of the battery. Disposal method: the battery is discharged by 1/10 the current capacity per hour (10h discharge rate) to reach the final voltage and then all electrolytes is poured out, and replaced with distilled water. After 1h, it is charged by 5 ~ 7A continuous current until the electrolyte specific gravity rises to 1: 150 or so. The final voltage is reached according to the above discharge, and overcharging is continued based on the previous charging current until the electrolyte specific gravity cannot rise, and the electrolyte specific gravity is adjusted to 1.280.

Discharge according to the above discharge rate. When the discharge capacity can reach 80% of rated capacity, it means that the processing work is nearly completed. If the discharge capacity is very small, the above discharge method can be repeated until the battery performance returns to normal state.

8) The charge-discharge degree of battery can be determined according to the specific gravity of the electrolyte or the discharger to measure terminal voltage and other methods. Therefore, a hydrometer is often used to measure the specific gravity of electrolyte shown in the figure, which can approximately estimate the electricity storage of battery, shown in the following table.

在20℃时电解液比重	存电情况
1.280	充电
1.240	25%放电
1.200	50%放电
1.160	75%放电
1.120	100%放电

9) When using batteries in cold areas, the thermal insulation shall be noted, and the electrolyte specific gravity shall be appropriately increased to prevent the freezing caused by decline in the electrolyte specific gravity. For example, when the ambient temperature is below -40 ℃, the electrolyte specific gravity should be increased to around 1.30 to 1.32, (value measured at 20 ℃).

10) When the battery separator is damaged or conductive metal falls into the battery or the bottom is accumulated with too much sediment, it can make the battery short-circuit, resulting in almost the same specific gravity of electrolyte charge and high temperature, low charging voltage and lower discharge voltage.

11) If the battery separator, battery jar and cover are found damaged, they shall be sent to specialized unit for repair or replacement.

12) When the batteries are used in low temperatures, due to the reduced discharge performance of the batteries and increased starter motor torque, the discharge capacity of one pair of batteries may not be enough, so two pairs of batteries can be used in parallel connection to maintain constant voltage of 24V to increase the current capacity of the battery.10 When the battery are in charging, the temperature is high, voltage is low, and specific gravity is low. Small bubbles or bubbles generating late in the charging stage means that the battery is internally short-circuited. If the battery bottom accumulated with too many sediments leads to short circuit, the battery can be discharged, and electrolyte be poured out, and distilled water is used to wash

repeatedly before charging. If there are other reasons, the separators shall be replaced or sent to relevant plant for repairs.

XVII. Diesel engine starting difficulties or unavailable starting while the exhaust pipe is smoking

1. Fuel system failure: Diesel engine is not ignited after driven by starter motor, and the oil return pipe has no oil return.

(1) Fuel system with air. Check if the fuel line connector is loose, and remove the air in the fuel system. First unscrew the bleed screw on the injection pump and fuel filter. Second pump oil via hand pump and tighten the bleed screw until the spilled oil has no air bubbles. Third pump the oil, when the oil return pipe has oil return, tighten the hand pump.

Release the nuts at the fuel injector of high-pressure oil pipe and pry high-pressure oil pump plunger spring base. When the fuel out of tube has no air bubbles, tighten the nut and then pry for a few times. The above operations are conducted by cylinders so that the fuel injectors of all cylinders are full of fuel. If the above measures can not drain air and starting are still difficult, the nut at the fuel injector of high-pressure oil pipe can be released, and let it directly running in the low speed for seconds, and then tighten the nut, and then start again.

(2) The fuel line is blocked. Check if the pipe is smooth.

(3) The fuel filter is blocked. Check if the pipe is smooth.

(4) Oil pollution. Test the starting of engine by a temporary fuel tank.

(5) Fuel delivery pump does not supply or continue to supply oil. Check the leakage of inlet pipe and the blocking of filter screen of inlet pipe connector. Check the inlet pipe and fuel delivery pump if supplying no oil even after exhaust.

(6) Very little fuel injection, no fuel injection or no fuel atomization. Dismantle the fuel injector, and connect it to the high pressure oil pump, spy injection pump plunger spring to observe the atomizing situation and wash it when necessary. Check and adjust the injection pressure to the specified range on the experiment table or replace the fuel injector couples.

(7) The operating handle of injector regulator is misplaced. The handle shall be pushed to no load position when starting, namely the position with a speed of about 700 ~ 900r/min.

2. Incorrect starting procedures. See the Maintenance Manual for all types of diesel engines.

3. The engine starting speed is too low. Enhance the start speed, generally slightly higher than idle speed. C6121 is put in the middle speed for starting.

4. Fuel oil return relief valve is failed. Check the injection pump oil return spill valve, and repair or replace it.

5. Electric starter system failure.

(1) Circuit connection errors or poor contact. Check if the connection is correct and reliable.

(2) Inadequate battery power. The battery with sufficient power or additional battery is used for parallel connection.

(3) No contact or poor contact of starter motor brush and commutator. Repair or replace carbon brush, and clean commutator surface with wooden sandpaper. Blow it clean, or adjust the brush spring tension.

6. Fuel angular advance is too early or too late, even differs by 180 degrees. Diesel engine fuel

injection is not ignited or parking after ignition. Check the correctness or looseness of scale on the combination dial of injection pump drive shaft, and readjust the scale if not meeting the requirements (for B-type pump used by 135-type diesel engines). For D6114 diesel engine uses P7100; P7 improved pump and EP-9 pump. If the time gear (P7100 pump or time slot P7 improved pump, EP-9 pump) is not aligned with time pin holes.

When CAT3300 series injection pump time pin hole is aligned with oil pump camshaft, the flywheel shall be in a time hole. The first cylinder is in the top dead center of compression and the time pin hole of oil pump camshaft. Screws with two corresponding holes can be inserted with many time pins, otherwise they need to be adjusted.

Wrong timing phase. Check the timing phase, if necessary, replace relevant wear parts.

Too low ambient temperature; long starting time can not cause ignition. According to the actual ambient temperature, the appropriate measures are taken for starting at low temperature.

XVIII. Diesel engine power shortage

1. Fuel system failure: the power or speed can not be increased by stepping on the gas.

(1) Fuel line and fuel filter have the air or obstruction. Eliminate or replace the fuel filter cartridge.

(2) Inadequate injection pump oil supply. Check, repair or replace couples.

(3) Bad injector atomization or low injection pressure. Observe spray or adjust the injection pressure, and check or replace the fuel injection nozzle couples.

2. Inlet and outlet system failure: higher exhaust temperature than the normal level and poorer smoke color.

(1) Air filter obstruction. Clean air filter cartridge or clear the dust on the paper filter cartridge, if necessary, replace and check the oil level of oil bath type oil filter.

(2) Obstructed exhaust pipes or too long adapters, too small turning radius, and too many elbows. Clear the carbon deposit in the exhaust pipe; reinstall the exhaust adapter, and elbows shall not exceed three, and the exhaust section shall be large enough. One sentence: reduce the exhaust resistance.

3. Fuel injection angular advance or intake and exhaust phase change; the performance is weakened in each gear. Check if the two screws at the injection pump drive shaft are loose, and tighten it after correction of fuel injection angular advance, if necessary, check the timing phase and valve clearance.

4. Diesel engine overheating, and too high ambient temperature; high temperature of engine oil and cooling water, and greatly high exhaust temperature. Check the cooler and radiator, and remove scale; inspect if the pipe diameter is too small. If the ambient temperature is too high, the ventilation shall be improved, and temporary cooling measures shall be taken.

5. Cylinder head component failure; at this time, there are inadequate power, poor performance and air leakage, inlet pipe with black smokes, abnormal beat and so on.

(1) There is air leakage at the joint surface of the cylinder head and body, and also a current of air out of gasket when changing speed; the big stud nut of cylinder head is loose or gasket is damaged. Tighten the big stud nut according to required torque or replace the cylinder head gasket, if necessary, repair and scrape joint surface.

(2) Air leakages of inlet and exhaust valve. Dismantle the intake and exhaust valves, and grind the joint surface of valve and valve seat, if necessary, replace it.

(3) Valve spring is damaged. Replace the damaged spring.

(4) Incorrect valve clearance. Readjust the valve clearance to the specified value.

(5) Air leakage of injector hole or damaged copper gasket. Replace copper gasket.

(6) Stuck piston rings. Replace piston rings.

(7) Engaged valve stem leads to inadequate cylinder compression pressure. Replace the valve.

6. The connecting rod bearing bush and the crankshaft connecting rod journal surface have trimmings; there is abnormal sound, and oil pressure drops and so on. Remove the side cover of the diesel engine, and check the lateral clearance of big end. Observe if the big end can move back and forth, if can not, it means it has trimmings. Grind the journal and replace connecting rod bearing bush.

7. Turbocharger failure: drops in speed; lowered intake pressure, air leakage or abnormal noises.

(1) Turbocharger bearing wear, the rotor is in friction, repair and replace the bearing.

(2) Contamination, obstruction or leakage of compressor and turbine inlet pipe. Clean inlet, enclosure, and wipe clean impeller; tighten the nut, clamps, etc, at joint surface.

8. Overloading. Check the failed parts, drive parts, additional load caused by brake damage and other types of increased vehicle load.

9. Improper connection of throttle connecting rod. Full check based on throttle control and adjustment of throttle connecting rod.

10. Poor fuel quality. Verify the vehicle with qualified diesel oil.

11. Air leakage of smoke detector air adapter, broken control film of turbocharger release valve, and damaged air control adaptor of turbocharger release valve. Tighten connector, if necessary, replace pipe, connector and control films. 12. Smoke detector adaptor blocks. Check the adaptors between intake pipe and smoke detector.

13. Damaged fuel delivery pump. Check and replace the fuel delivery pump.

14. Too high oil level. Discharge the oil to the normal oil level.

15. Too high intake temperature. On a hot day, the air outside hood is introduced into supercharger; check if intercooler heat sink is blocked and clean it. Check the internal resistance of the intercooler, clean or replace in the intercooler. Check and clean the pipe before the intercooler.

16. Fuel temperature exceeds the national standard. Close the fuel heater, if the temperature is too high, the vehicle may stop, if appropriate, to reduce fuel temperature.

17. Air leakage between the turbocharger and the exhaust pipe. Check the cracks of exhaust pipe.

18. Low compression pressure. Damage valve seat and valve; wrong valve timing, cam wear of the intake and exhaust valves; valve plunger and plunger sleeve are worn out; gas clearance or too large volume of combustion chamber. If the above parts can not be restored after operations, replace them.

19. For engine running in the speed adjusting characteristics, adjust and improve the speed of take-off point. The main cause is the difference between engine rack speed and pump test bench speed. A simple method is to turn the governor high-speed screw in the direction of high speed, but not spinning it too much, otherwise it may easily lead to too high maximum idling speed. Therefore, it is better to test on the pump test bench, and make an adjustment.

WORKING HYDARULIC SYSTEM:

Ailisheng737/Ailisheng738

☆Obviously slow lifting while loader is under overloaded or unloaded status

Main cause: The safety valve is constantly open.

① The valve core is blocked. Remove the valve core and clean the valve core and valve body. The valve core and valve body shall be ground together to guarantee that the valve core moves smoothly in valve body.

② Poor air-tightness of guide valve. The guide valve shall be ground together to guarantee air-tightness.

③ Damage or excessive compression set of guide valve spring. Replace the spring.

④ Loose guide valve lock nut or pressure regulating bolt. Re-regulate the pressure and then lock the pressure regulating bolt by lock nut.

☆The lifting speed is normal under unloaded status, but is reduced gradually following the increasing of loading weight.

Main cause: Lowered unloading pressure.

① Excessive compression set or lowered spring force of guide valve spring. Replace the spring.

② High wearing of guide valve sealing surface and lowered spring force. Re-regulate the pressure.

③ Loose guide valve lock nut or pressure regulating bolt. Re-regulate the pressure and then lock the pressure regulating bolt by lock nut.

Malfunctions of Working Hydraulic System

No.	Malfunction	Cause	Solution
1	Insufficient working pressure	Low regulated pressure of safety valve	Adjust pressure of safety valve
		Blockage of slide valve for safety valve	Disassemble for cleaning and reassemble
		Damage of pressure regulating spring	Replace with new one
		Failure of pump	Repair pump
		Excessive pressure loss of system pipeline	Replace pipeline or regulate safety valve pressure within

			allowable pressure range
2	Insufficient working flow	Overloaded so that safety valve is opened	Limit load within rated value
		Failure of safety valve	Check and repair
		Insufficient oil supply	Check and repair oil pump
		Excessive internal reversing leakage of valve High oil temperature Improper choice of oil	Take measure to cool down oil Replace oil

No.	Malfunction	Cause	Solution
3	Without position feeling in lift arm control lever	Failure of lift arm slide valve positioning spring	Replace spring
4	Return failure	Stagnation of control lever	Repair
		Deformation of distribution valve return spring	Replace with new one
		Dirt between distribution valve body and valve body	Clean parts
5	Excessive lowering of lift arm	Excessive wearing gap between distribution valve body and valve rod	Replace valve rod
6	Tilt-down excessively of bucket	Overflow refilling valve is blocked by dirt	Disassemble for cleaning and reassemble

Ailisheng757

Trouble shooting

1. Under normal condition, the lifting speed of the loader is normal. When overloading lifting or operating a compelling digging, the load of the engine is increased. If there is black smoke coming from the engine and the traction force is weakening, and when lifting under overloading condition, there is no obviously weakening for the lifting speed.

Main reasons: Failure to open unloading valve. the valve spool shall be dismantled for being cleaned. The valve body and spool should be ran-in to ensure the valve spool move freely in valve body.

2. The lifting speed of the loader is obviously slow when no-loading and overloading.

1) Main reasons: The unloading valve is always in open state.

① The valve spool is locked. the valve spool shall be dismantled for being cleaned. The valve body and spool should be ran-in to ensure the valve spool move freely in valve body.

② Guide valve is not sealed. Please run-in the valve to ensure seal.

③ The spring of the guide valve is damaged or is of serious deformation. The valve shall be changed.

④ The nut of guide valve and surge bolt loose. The pressure shall be readjusted, after the adjusting, hold the surge bolt firmly with the nut.

3. The lifting speed of un-loading is normal. When increasing the loading gradually, the lifting speed is lowered gradually. Main reason: The pressure of unloading is reduced.

① There is seriously permanent deformation of the guide valve spring. The strength of the spring is reduced. The spring shall be changed.

② The closed face of the guide valve is in seriously abrasion. The strength of the spring is reduced. The pressure shall be readjusted.

③ The nut of guide valve and surge bolt loose. The pressure shall be readjusted, after adjusting, hold the surge bolt firmly with the nut.

Malfunctions of Working Hydraulic System

No.	Malfunction	Cause	Solution
1	Insufficient working pressure	Low regulated pressure of safety valve	Adjust pressure of safety valve
		Blockage of slide valve of safety valve	Disassemble for cleaning and reassemble
		Damage of pressure regulating spring	Replace with new one
		Failure of pump	Repair pump
		Excessive pressure loss of system pipeline	Replace pipeline or regulate safety valve pressure within allowable pressure range
2	Insufficient working flow	Overloaded so that safety valve is opened	Limit load within rated value
		Failure of safety valve	Check and repair
		Insufficient oil supply	Check and repair oil pump
		Excessive internal reversing leakage of valve	Take measure to cool down oil Replace oil

		High oil temperature Improper choice of oil	

No.	Malfunction	Cause	Solution
3	Reset Failure	The resetting spring of the pilot valve is deformed	Replacing a new one
		There is filth between the compressed rod of pilot valve and mating hole	Clean parts
		The resetting spring of distribution valve is deformed	Replacing a new one
		There is filth between the body and body of distribution valve	Clean parts
4	The orientation of the pilot valve is unreliable	Lack of suction of electromagnet	Replacing a new one
		The current and voltage of electric circuit fail to meet the requirement.	Repair
		There is filth between electromagnet and the surface of spring seat	Removing the filth
		The adjustment of the gap of swing plate and the compressed rod fail to meet the requirement	Adjusting according to the requirement.
5	The tilt arm lowered excessively	The gap between the body of distribution valve and valve rod is increased.	Replacing a valve rod

No.	Malfunction	Cause	Solution
6	The bucket dropped	Overloading valve and make up valve is locked by filth	Dismantle for being cleaned, then assemble them again.
7	The control of pilot valve is	The spool of the measurement valve is locked	Checking the cleanliness of oil, cleaning the valve spool and

	failed	or fail to work.	valve hole.
		The measurement spring is deformed	Replacing the spring
		Lack of control flow or control pressure.	Checking if the pilot oil supply system is working smoothly.
		The main valve works inflexibly.	Cleaning the valve body and valve rod
8	Leakage	O-ring is damaged	Replacing of a new one
		Fasteners loose	Tightening the corresponding fasteners

STEERING HYDRAULIC SYSTEM

Malfunction Analysis and Troubleshooting of Ailisheng wheel loader, forklift loader and log loader steering hydraulic system.

1. Heavy steering

① Normal at slow rotation of steering wheel, but heavy at fast rotation

a. Air in the system. When the oil level is low, the return of oil will bring in a large amount of air. In such case, add the oil timely. It may further rotate the steering wheel after rotating to limit position to open the overflow valve and drain the air.

b. Insufficient control pressure of priority valve and lowered spring force. Check the spring for damage or excessive compression set of spring and replace the spring timely.

c. The priority valve core is blocked at certain position. Disassemble the valve core, clean the parts such as valve body, and grind the valve core and valve body together. Make sure that the valve core moves smoothly in valve body.

d. Damage or insufficient flow of oil pump. Repair or replace accordingly.

② Light under unloaded status, but heavy under loaded status.

a. Low regulated pressure of steering overflow valve. Check the spring for damage or excessive compression set and replace accordingly. 2) Loose lock nut and pressure regulating bolt. Re-regulate the pressure and lock the lock nut.

b. Sealing failure of overflow valve and defect in sealing surface of valve core or valve seat. Repair accordingly.

c. Low cushion valve pressure in valve block. Check the spring for damage or excessive compression set or check sealing surface for sealing failure and replace the spring or repair accordingly.

d. Damage or insufficient flow of oil pump. Repair or replace accordingly.

③ Heavy steering at light accelerator, but normal at heavy accelerator.

a. Damage or insufficient flow of oil pump. Repair or replace accordingly.

b. Excessive fit gap between valve core and valve body of priority valve. Replace valve core or assembly accordingly.

2. No limit feeling at rotation and light rotation of steering wheel after rotating to limit

position.

① Serious wearing and excessive gap of steering valve body, valve core, valve sleeve or stator/roller. Replace the worn-out parts or steering valve.

② Low opening pressure of overflow valve or cushion valve. The solution is same with above.

3. Steering failure

① Failure of automatic return of steering wheel and breakage of spring piece. Replace accordingly.

② Clear pressure tremble or even rotation failure. The pin or coupler shaft is damaged and shall be replaced.

③ Thorough damage of oil pump or shear-off of square key. Repair or replace.

4. Occasional action of hydraulic cylinder at rotation of steering wheel, with irregular noise.

This may be caused by the air in the steering system or excessive internal leakage of steering hydraulic cylinder. Open the oil tank cap and observe the oil tank for presence of foams. If yes, check oil tank for air leakage, check various pipeline connectors for intactness, and bleed the air from system. If the hydraulic cylinder only functions occasionally, check the sealing status of piston and replace seals when necessary.

5. If the steering wheel rotates by itself or swings left-and-right, this may be caused by the inverse installation between rotor and drive rod.

In such case, disassemble the steering valve and engage the tooth of drive rod with the tooth of roller spline hole, punch point to punch point.

6.Sudden feeling of heavy steering or rotation failure of steering wheel. Cause analysis and troubleshooting:

(1) Insufficient oil suction. Insufficient oil in oil tank, excessive oil viscosity, or blockage of oil suction filter will lead to the oil suction failure of the oil pump. In such case, check the oil level in the oil tank, add enough hydraulic oil, replace with proper oil, and clean or replace filter core.

(2) Excessive wearing and excessive internal leakage of oil pump. Check the working status of oil pump and repair or replace.

(3) If the steering check valve is not installed, the impurity lifts the steel ball of check valve to cause poor sealing with valve seat, or the steel ball of check valve drops into groove ring between valve sleeve and valve body, these will lead to poor sealing of check valve and interconnection between oil inlet and oil outlet during steering. In such case, check the installation status of check valve, check the oil cleanliness, and clean the steering valve. Check the sealing status between check valve steel ball and valve seat. In event of poor sealing, repair by grinding and replace with new steel ball.

(4) Failure and early opening of steering valve safety valve. Check the safety valve spring for deformation or failure. In event of insufficient spring force, add gasket between spring and spring seat.

(5) The deformations of valve core and the valve sleeve will lead to the blockage of both parts. Before installation, add some hydraulic oil via oil inlet. The rotation of valve core shall be smooth. In event of any stagnation, grind the valve core. Sometimes, the non-uniform application of force while tightening the bolts at bottom of steering gear will lead to blockage of valve core. The correct way is to tighten the bolts uniformly by 2~3 times.

7. Serious vibration of steering wheels. Cause analysis and troubleshooting:

(1) Mechanical malfunction. Such as the increased gap due to wearing between connecting

pins or the wearing at bearings of steering wheels. In such case, check the gap and replace the parts to restore the normal working status of the system.

(2) Air in steering cylinder. In such case, loosen the oil port connector at one end of steering cylinder, rotate the steering wheel so that the oil flows via steering gear to the chamber at another end of steering cylinder, till the oil flowing out from the loose connector is free of air bubbles, and then tighten the connector.

8. The steering wheel can rotate without any limit, but steering wheels have no movement. Cause analysis and troubleshooting:

This is mainly caused by the failure of dual-directional cushion valve or the damage of hydraulic cylinder piston seal ring. Replace the hydraulic cylinder piston seal ring and check the dual-directional cushion valve to guarantee the close fit between valve core and valve seat.

DRIVING SYSTEM

What is the common trouble shooting of Ailisheng wheel loader Driving Axle? Why? How to deal with them?

Common troubles of axle: abnormal noise of the main drive differential, damage of the main drive bearing, damage of the main driven spiral bevel gear, oil leakage, overheat, damage of the wheel hull bearing, damage of the wheel planetary reduction gear, crack of the axle welding seam or fracture of the axle housing when the circumstance is severe, etc.

(1) Abnormal noise of the main drive differential

The abnormal noise is produced because the clearance between the driving and driven spiral bevel gears is abnormal, and the meshing plane is unstable. The gear meshing clearance refers to the clearance among the driving and driven spiral bevel gears, the bevel gear, the axle shaft gear, the axle shaft gear key and the half axle spline tooth. Due to abrasion or gear tooth damage and bearing loosening, the normal meshing place and normal meshing clearance are damaged, thus the noise will be produced due to collision and abrasion during running.

(2) Oil leakage

Main causes of oil leakage:

A. Oil seal abrasion, improper assembly or damage;

B. Shaft ends abrasion and excessive spline abrasion;

C. Blockage of the ventilating valve on the axle;

D. Casting defects (sand blisters and pores) or cracks on the casing, uneven junction plane, damaged gasket and loosened fastening blot;

E. The lubricating oil is excessively filled into the axle housing and leaks because the oil drainage screw plug is not screwed down.

(3) Overheat

After the loader runs for a certain mileage, the oil temperature of the axle housing and the temperature at the main driving flange shall not exceed 90℃. Generally, the main reducer housing can be touched by hand. If the hand has unendurable burning feeling when touching, it is called overheat. The heat can be measured with the thermometer with a contact. The causes of overheat are excessively small bearing meshing clearance and lack of the lubricating oil. When the bearing part is touched by hand, and the hand can endure but can not stay for a long time, it shows that the

temperature is excessively high, and the bearing assembly is over tight and shall be readjusted.

(4) Other troubles

A. Curving and cracks of the axles housing. The main causes are that the loader operates under the long-term overload condition, and is not decelerated on the rough road to cause the axles under the large impact vibration and metal fatigue damage.

B. Damage of the main driving bearing. The main causes are that firstly, the lubricating oil is insufficient or the lubricating oil duct is not smooth to cause the bearing lubricating condition to be worse and burn; secondly, the bearing clearance becomes large, and abrasion happens in advance to cause damage because of long-term heavy load operation.

C. Damage of the wheel hull bearing. The main causes are that the taper roller bearing operates under the long-term heavy load to cause the ends to be abraded excessively ad the bearing clearance to be larger.

D. Break-off of the half axle. When the loader is highly loaded on the rugged ground, the bearing torque of all parts is extremely high. If the axles jumps up and down, the engine acts on the main drive differential suddenly, and the action force is transferred to the half axle for an instant, and the stress on the half axle is extremely high to cause break-off.

How to adjust the main drive and wheel speed reducing mechanism in Ailisheng wheel loader, forklift loader and log loader?

1) The assembly and adjustment of the bearings 27310 and 27311 on the driving spiral bevel gear shall in Ailisheng loaders meet the following requirements:

Under the condition that the driving spiral bevel gear is not meshed and not equipped with the oil seal and the oil seal cap, adjust the spacer in a gradually thinning method so that the castle nut is hooked into the assembly hole of the input flange with the tension meter under the locking force of 35-40 kg·m. Pull the tension meter toward the tangent direction so that the reading of the tension meter is 4-5 kg when the input flange begins to rotate. The castle nut need the locking force of 35-40 kg·m during final assembly.

2) The assembly distance of the spiral bevel gear must be adjusted to be correct to ensure that the gear is correctly meshed. The contact surface and the correct gear side clearance can be achieved by adjusting the nut and the spacer. The meshing of the driving and driven spiral bevel gears shall be inspected in a staining method. The contact spot is about 30%-50% along the gear length, 50% along the gear height and keeps the meshing clearance of 0.2-0.25 mm.

3) The meshing clearance between the half axle gear and the bevel gear of the differential is 0.1 mm to ensure that the half axle gear and the bevel gear can be rotated easily by hand without blocking.

4) The bearing 7515 is adjusted with the adjusting nut to ensure that the clearance is kept within 0.03-0.05 mm.

5) When repairing and replacing the wheel speed reducing gear, check the contact condition in a staining method, the contact spot is not less than 40% along the gear height and not less than 50% along the gear length. When replacing the planetary gear roller pin, match all roller pins in groups to ensure that the internal diameter allowance of the same group does not exceed 0.005 mm. The ellipticity and taper are smaller than 0.003 mm, and the radial fit clearance between the roller pin inner hole and the pin is 0.015-0.03 mm.

How to detect the driving Axle Parts in Ailisheng wheel loader, forklift loader and log loader?

(1) Check whether all gears, shafts, splines and spiral parts have cracks, notches, dents, pit corrosion or excessive abrasion.

(2) Check whether the left and right differential housings and the cross shaft have uneven abrasion, cracks, notches, dents or distortion. Check whether the bevel gear spacer and the half axle gear spacer have abrasion, and measure the internal and external clearance of the spacer. When the clearance difference is larger than 0.13 mm, the spacer shall be replaced. It is recommended that all spacers should be replaced simultaneously so as to adjust the meshing clearance of each gear pair to be consistent.

(3) Check whether the bracket of the main drive, the bearing sleeve and the matching hole of the wheel planetary carrier have cracks, notches, dents or excessive abrasion. Replace them when necessary.

(4) Check whether all the bearings are burnt, decorticated, pitted, broken off, depressed, or inflexibly rotate, the isolating carrier is damaged, and the bearings have abnormal noise. Replace them if necessary. Check whether the roller pin in the wheel planetary speed reducing mechanism is abraded or damaged.

(5) Check whether the planetary spacers on the two end surfaces of the planetary gear in the wheel planetary speed reducing mechanism are flat without burrs, cracks, notches or scratches. Replace them when necessary.

Relevant Questions of Axle

The axle is equipped with the differential and two fully floating half axles, but not the driving wheels on two sides are fixed on a whole axle, because the driving wheels of the wheel engineering machine on the left and right sides is required to rotate at different angular velocities at all times in order to avoid wheel sliding in the rolling direction.

1) During turning, the distance traveled by the wheels on the outer side is longer than that on the inner side.

2) When the machine runs on the rugged road, the lengths for which the wheels on the right and left sides contact the ground are unequal;

3) Even though the machine runs on the plain road in a straight line, because of the unequal radius due to the tolerance of tyres, the difference of the tyre air pressure or uneven abrasion or unequal load, the rotating speeds of the left and right wheels at the same time are unequal.

Under the above conditions, if the left and right driving wheel is driven with an identical axle, the sliding and abrasion phenomena of the driving wheel will be caused. In order to ensure that the sliding and abrasion degree of the wheels relative to the road is reduced as far as possible, the differential is installed in the axle, and two half axles are driven the main drive through the differential.

Why is the rear axle equipped with the under-frame or the swing frame in Ailisheng wheel loader, forklift loader and log loader? Why not be rigidly connected with the frame like the front axles in Ailisheng loaders?

If the front and rear axles are connected to the frame in Ailisheng loaders, four points

of the Ailisheng loader will be contacted with the ground during the running process; when the Ailisheng loader runs on the uneven ground, the fourth wheel will be suspended not to have the function of supporting the whole Ailisheng loader because three points (wheels) can determine a plane; at the same time, because the three wheels bear excessive loads, all parts will be easily damaged. So through the under-frame or the swing frame of Ailisheng loaders, the rear axle and the frame are in the non-rigid connecting state, and can swing in the running process, so that two wheels of the rear axle can contact the ground simultaneously no matter whether the ground is flat.

How to maintenance of transmission of Ailisheng wheel loader, forklift loader and log loader?

Whether the transmission is in a good condition or not relates to the performance of the whole machine. Thus, besides routine maintenance, pay attention to the following items:

1. Working oil level of the transmission

Before starting the engine, inspect two oil drainage cocks on right side of the transmission, the upper cock shows the highest oil level, the lower cock shows the lowest oil level. Ensure that the oil level is between the upper cock and the lower cock after oil filling.

2. Working oil pressure

The working oil pressure of the transmission is 1.08-1.47 MPa. If it is abnormal, it shall be checked. The abnormal working pressure of the transmission clutch is related to the leakage of the transmission pump and the blockage of the transmission valve. If the pressure is excessively low, the clutch friction disc will slide and be worn till the machine stops operating, thus it should be noted during the maintenance process.

3. Oil Temperature

Generally, the operating and running temperature shall not be over 110℃, if any, the engine shall be stopped to cool and inspect.

4. After the running-in period, generally after running for 600 hours, the oil shall be replaced for the transmission. But if the oil is deteriorated or mixed with foreign matters when being inspected, the transmission shall be cleaned, inspected and replaced with new oil of the specified brand.

5. The torque converter oil filter shall be cleaned or replaced frequently.

I. What are the possible causes of the excessively low pressure at all gears of the transmission in Ailisheng wheel loader, forklift loader and log loader?

1) The pressure at three gears is excessively low, the oil temperature is normal, and the loader can not be driven.

A. The transmission pump is severely burnt, the efficiency is excessively low, or the oil level of the transmission is excessively low, and the oil supply quantity is insufficient.

B. The spring of regulating valve fails and loses elasticity. The spring seat is broken off, and the valve stem or the accumulator piston is blocked not to compress the spring, so the system pressure is abnormal.

C. The shutoff valve stem is blocked or the return spring is broken off to cause the shutoff valve to be at the shutoff position for ever.

D. The pressure gage is inaccurate to indicate the pressure readings at all gears of the

transmission, so that the users shall check whether the pressure gage is damaged or not if they need to improve the pressure of the transmission.

2） The reverse-gear pressure is excessively low, the first-gear and second-gear pressure is normal, and the oil temperature is normal. What are the causes?

Whether the reverse cylinder of the case body has cracks or not shall be checked. The cracks are generally caused by the excessively high system pressure. The excessively high system pressure is caused by the damage of the pressure gage. The operator does not find damage but arbitrarily increase the pressure to cause the system pressure to exceed the specified value actually.

3) The second-gear pressure is excessively low, the first-gear and reverse-gear pressure is normal, and the oil temperature is normal.

Check whether the rotary oil seal at the matching position of the end cover of the transmission and the second-gear oil cylinder body is damaged or not assembled. Check whether the O-ring of the oil outlet of the second-gear oil duct at the jointing position of the case body and the end cover is damaged or not assembled, and also check whether three piston guide pin of the second-gear oil cylinder body is dropped out to cause the second-gear high pressure chamber to be communicated with the oil sump so that the system pressure is abnormal.

II. What are the causes of the gear disorder or trip stop of the transmission in Ailisheng wheel loader?

The direct cause of gear disorder or trip stop is inaccurate shift valve step positioning, for example:

1) Two positioning steel balls in the shift valve stem and the valve body are not aligned with the groove, or the springs of the two positioning steel balls are damaged or positioned wrongly.

III. The traveling speed of the loader is low but the loader operates effectively, and the pressure at all gears of the transmission is normal. What are the causes?

The external ring gear and the internal ring cam of the overrun clutch can not be disengaged to work separately. At this time, the internal ring cam, 24 rollers, the isolating ring, the gland and the spring shall be replaced.

Trouble shooting of torque converter

(1) **What is the reasons for over high oil temperature of torque converter in Ailisheng wheel loader, forklift loader and log loader?**

- a. The speed gear pump burns out; the oil level of transmission oil tank is too low or too high; the primary filter screen of the transmission oil sump is blocked or the filter element is blocked; oil supply volume of the oil circuit is so little that the system fails to offer enough fluid flow to release the heat, which then results in over high oil temperature.
- b. The engine belt is loose; air exhaust volume is insufficient; the oil fluid radiation is slow; the water level of water tank is relatively low, or the pipelines in the engine oil cooler break which causes the coolant volume insufficient and the cooling slows down. If oil is found in the water tank, it can be generally concluded that the pipeline of the oil

radiator breaks.

- c. Since the fuel supply system is shared by the transmission and the torque converter, if the pressure of each shift in the transmission is too low (less than 0.8MPa), the friction disc of the gear position in the transmission will slip, give out heat, and also cause over high oil temperature.
- Troubleshooting: adjust the transmission pressure to 1.08-1.47MPa.

d. When 24 rollers in the overrunning clutch (two-shaft assembly) are fixed and mechanical friction is generated, the oil temperature may also have a sharp increase though the system pressure is normal.

- Troubleshooting: replace the two-shaft assembly.
- e. The rotary oil seal which is positioned at the mating face of the inner hole of transfer gear and the guide roller seat is damaged; the large amount of operating oil is leaking inside the torque converter and directly flows back to the oil sump (inside the transmission), which will also cause a sharp increase in oil temperature of the torque converter.
- Troubleshooting: replace the rotary oil seal.
- f. Improper operation, too frequent engine throttle increase, long-time overload operation of the loader, or excessive time of operation under braking condition which may also lead to drastic increase in oil temperature.

(2) **Why the starting motor bleeds oil?**

- The rotary oil seal positioned at the mating face of transfer gear and guide roller seat is damaged, causing the starting motor to bleed oil.

What is the Functions of Transmission in Ailisheng wheel loader?

1. Changing the transmission speed ratio of the engine to the wheel, thereby changing the running speed and driving force of the machine to adapt to the operating and running demands.

2. Making the machine run backwards.

3. Cutting off the power (shifting to the neutral gear) transferred to the traveling device to ensure that the machine can be shut down for a long time under the engine operating condition to facilitate engine starting and stopping safety.