Gas equipment maintenance

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Abstract. The article describes the operation features of the vehicle and tractors transport, equipped with gas equipment. Bottle-gas driven automobiles and tractors transport compared to cars and tractors transport, working on liquid fuel, have a number of features caused by the presence of their gas supply system under pressure. The organization and maintenance features of both the power supply system and the vehicle as a whole are taken into account.

Introduction

Internal combustion engines are among the most common heat engines. The idea of burning fuel inside the piston machine cylinder arose at the end of the 13th century, but it was only in the second half of the 19th century that the conditions for the development and production of internal combustion engines were created. The first such engine, created in 1860 by the French mechanic E. Lenoir, worked on the luminaire gas in a two-stroke cycle without first compressing the charge. In 1879 in Russia, I.S. Kostovich created an engine draft for the airship, which worked on liquid fuel (gasoline). In 1896, German engineer R. Diesel designed a compression-ignition engine. In Russia, it was only in 1899 that they started creating such an engine. Internal combustion engines (ICE) have found application in most sectors of the national economy, and first of all in motor vehicles. One of the main technical and economic factors of the engine are reliability and durability. Durability is characterized by the service life and resource. The resource, in turn, is influenced by many factors, including:
- climatic conditions;
- the engines (machines on which the engine is installed) operation mode;
- quality of consumables (working mixture, lubricants, technical fluids) and other factors.

The engine is the most important element of any tractor mechanism. It is a device of extraordinary complexity, which includes a huge number of various components and parts. In addition, each of them performs its own unique functions.

Objective

Gas equipment and diagnostics should be supported using modern equipment. This helps to significantly increase the operating time of all systems. Gas equipment installation is justified in about 5 years, it is likely that it will fail if it is done without adhering to all the methods.
Result and discussion

Gaseous hydrocarbon fuels, which are ecologically clean motor fuels, are most widely used in automotive and tractor transport.

To supply the engine with gas motor fuel in automobile and tractor transport requires the widely used gas-balance equipment systems implementation.

The sixth generation supports the requirements of Euro - 4 (5 and 6). It is very economical, allows to start the automobile and tractors at low temperatures. And most important - the dynamic parameters of work in practice coincide with the characteristics of the engine on gasoline. No need of maintenance is one more advantage of the sixth-generation engines.

In recent years, there has been an increase in the number of motor vehicles and tractors around the world, including in Russia, which has increased interest in bottle-gas vehicles (BGE) using compressed natural gas (CNG) as a motor fuel. This is due to the increase in oil prices, strict environmental requirements for internal combustion engines, the desire of governments of economically developed countries to switch to renewable forms of energy.

Technological processes of maintenance and repair (TM and TR) of BGE operating on CNG have a number of specific features. On the territory of the servicing enterprise the following should be organized: post leak testing of gas-balloon equipment; post release (accumulation) of gas and degassing cylinders; Specialized site for maintenance and installation of gas equipment; warehouse for storage of emptied degassed cylinders for CNG; open storage areas for BGE.

Maintenance of gas equipment implies, carrying out routine maintenance for the replacement of filter elements or their cleaning, depending on the design features of the automotive and gas system tractors.

TM Regulation: replacement of the filter element, most gas systems of the 4th generation is regulated by mileage (10-20 thousand / km). For traditional BGE (bottle-gas equipment) systems 1.2 (30 thousand / km), work is also carried out to drain the condensate from the gas reducer (only for 1.2 generation BGE).

This system’s reliable and long-term operation requires periodic maintenance. As a rule, maintenance consists in replacing the filtering elements of the liquid and vapor phases, setting up the gas system, checking gas leaks, checking the system’s rubber pipes’ condition and periodically draining gas condensate from the gearbox, depending on the gearbox design.

BGE maintenance is a must-have event, and should be carried out regularly. The point here is not even so much in maintaining the working condition, but in the safety of the motorist and the tractor itself. After all, any BGE generation use is inevitably associated with increased risk. Gas equipment maintenance on a car has a certain regulation, the observance of which is mandatory: filters replacement; condensate drain from the gas reducer; setting gas nozzles; checking the pipes’ state; gas leak check; diagnostics of all gas systems.

Gas equipment maintenance its diagnostics should be performed using the modern equipment. This helps to significantly increase the all systems operation duration. Gas equipment installation justifies itself in about 5 years, within this period it will most likely fail if maintenance has been carried out without complying with all the technologies.

Replacing filters

This gas equipment servicing stage for the automobile and the tractor can be carried out independently, therefore many motorists are interested in the details of this process. First of all, it is necessary to observe the safety precautions. All work should be carried out only in the open air; repairing BGE indoors is strictly prohibited. This point will also help to determine the master qualifications. No one specialist will repair the BGE indoors. In general, timely maintenance helps to significantly increase the BGE use duration and save in the future.

During maintenance (TM-1) in the main period of operation the following types of work are performed:

- Inspection by external examination of the state and mounting gas cylinders.
Damage to the outer surface and loosening of the fasteners is not allowed;
- Checking the external inspection of the state of gas pipelines;
- Check the high-pressure gear by the tester-programmer;
- Checking the filling operation and the filling cross consumable valves for smooth operation and reliable closure;
- The engine gas supply system filter element replacement.

The use of gas as a fuel requires the special equipment use. Incorrect use of gas equipment may lead to tragic consequences, to avoid this, it is necessary to follow some rules:

1. One of the features of using the fuel to create gas fuel is that butane and propane are mixed in a certain proportion. Both gases are very aggressive and can adversely affect various substances. For a short period of time, they are capable of destroying: wood, plastic, rubber, glass and other materials. There are two types of gas fuel: summer and winter version. They differ in propane content. The summer version of gas fuel contains no more than half of propane.

   In the winter version, its content can reach up to 90%. It all depends on the gas fuel manufacturer. This is due to the fact that propane can evaporate at a very wide temperature range.

2. Filling with gas fuel. In cars and tractors gas fuel is stored in special cylinders. They are placed mostly in the luggage compartment of the vehicle. When filling the cylinder, it must be remembered that it is charged at 80% of the nominal volume. The remaining 20% of the space in the gas cylinder is needed to accommodate the “steam cushion”. It is formed by the gas evaporation. It is due to the “steam cushion” formation which creates excess pressure, the gas begins to flow to the engine. Equally important is the “steam cushion” in terms of BGE safety.

   If, with a sharp increase in temperature, the gas volume inside the cylinder increases, it moves to the free space. If there was no place, then there was an explosion with the most tragic consequences. It is important to remember and take into account these nuances when using gas fuel.

   Modern gas equipment systems are hermetic and do not allow gas. Therefore, the presence of the gas smell in the car is not observed. If, for a number of reasons, a large amount of condensate reducer and hoses become impregnated in gas fuel, then it is impossible to avoid the gas smell in the cabin.

3. Working the gas engine. The gas and air mixture entering the engine cylinders is fundamentally different from the traditional gasoline. Gas fuel does not destroy the oil film on the cylinders’ walls, does not lead to the engine oil quality characteristics deterioration and does not form carbon. The gas use has a positive effect on the engine operation, but only with the proper BGE use. The only drawback of gas fuel is that it reduces the machine engine unit’s power by a few percent. Experts believe that this is due to the following factors:

   - reduction of maximum pressure in the engine cylinders;
   - reduction of the operating cycle temperature;
   - the motor combustion chamber filling coefficient is reduced.

   Some motorists say that the vehicle acceleration dynamics is slightly reduced. This may occur due to the inertia of the power system of the car and the tractor. Since the gas from the installation to the engine cylinders moves through the hoses, it will get to them with some delay. Their length directly affects the gas speed.

   BGE installations allow the vehicle driver to switch from gasoline to gas and, conversely, in real time. Many motorists do not know the individual nuances and can disrupt the engine operation with their unconscious actions. If to switch the engine operation mode from gas to gasoline, it is possible to immediately move the switch to the extreme position, as with switching from gasoline to gas there is one feature.

4. The gas engine start with gas as fuel is possible only at the heated-up motor. It should reach the working temperature, in the summertime one can ignore these recommendations, but this will not work in winter. At low temperatures, the motor will refuse to start without warming up, since the gas has a low burning rate and a high ignition temperature.

5. Maintenance. The BGE use implies a special maintenance. It is not recommended to ignore it. Be sure to perform the following operations:
- the filter element cleaning every 5 thousand mileage;
- the filter element replacement after 15 thousand runs;
- at least once a month to drain condensate from the heated gear;
- the air filter and spark plugs replacement interval reduction;
- at least once a month it is necessary to check the BGE for tightness.

Competent and safe installation operation is as follows:
1. At least once a month to check the reliability of fixing the cylinder;
2. If there is a strong gas smell in the cabin, stop using the machine until the leak is corrected;
3. If a gas leak is detected, immediately shut off the supply valve and stop using the vehicle;
4. It is forbidden to independently undertake repair work in case of a gas leak or use a cigarette lighter or matches to locate the leak;
5. If there is a collision in an accident, it is necessary to shut off the gas supply in order to avoid the machine ignition;
6. If the long-term parking is ahead of the machine, it is necessary to shut off the supply valve and fully work out the gas in the system;
7. When the gas supply system is operating, the supply valve must be opened completely, as this will reduce the likelihood of gas deceleration during movement.

Depending on the type of cylinder, it is recommended to check gas equipment once a year or two. Usually, the first BGE diagnosis of the car and the tractor must be made 10 months after its installation, and subsequently - according to the data in the cylinder data sheet.

The gas equipment location also matters. If the cylinder is under the machine bottom, then it is advisable to check it at least once a year, preferably in the spring. This is due to the operating conditions deterioration, which is associated with the likelihood of salts and stones falling on the body of the product, fittings and pipes.

In addition to the regular BGE maintenance, its unscheduled inspection might be necessary. The following signs may indicate the need for the vehicle and the tractor gas equipment diagnostics: such characteristic appearance as the gas smell; increased gas consumption, reduced mileage; problems in starting the engine; deterioration in dynamics; engine overheating, interruptions in its operation; burnout exhaust valves, as well as their saddles; accelerated aging of the catalyst.

Summary
Regular diagnostics and, if necessary, adjustment of gas equipment reliably prevents the occurrence of these problems. When performing BGE diagnostics, all the elements of the vehicle gas supply system and the tractor are checked. Specialized stands and computer testing, which can be performed by a universal or dealer scanner are used. The latter has the widest functional set, often it even provides for guided diagnostics, i.e. the scanner can not only determine the fault code, but even the node of its occurrence.

Be sure to check the system tightness, for which air is pumped into it under 1.6 MPa pressure. The gas cylinder and all other elements are monitored, nozzles, power wires, control devices, gasoline correctors, etc. are checked.

In case of deviations detection or malfunctions, adjustment and, if necessary, the automobile and the tractor BGE repair is carried out. The most time-consuming is the gas cylinder inspection, which requires a whole range of operations, including gas drainage, degassing, disassembling and then re-mounting the valve, inspection, pneumatic and hydraulic tests, drying, etc.

When servicing BGE regular replacement of fluid and air filters (usually for every 10-15 thousand km) is required. The need for inspection of the cylinder significantly affects the service costs. Too rich mixture causes the exhaust system burnout and the catalyst premature failure. A guarantee against the occurrence of such problems is the correct setting of the automobile and tractor.

Thus, it is possible to achieve a minimum loss of engine power during the transition from gasoline to gas and at the same time the lowest possible gas consumption.
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