THE ANALYSIS OF THE DEVELOPMENT OF GAS CYLINDER SUPPLY SYSTEM

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ABSTRACT

This article analyzes the process of improving the supply system of gas cylinder cars. It is based on the types of state-of-the-art gas cylinder equipment currently installed in engines and the structure, principle of operation and environmental and economic efficiency indicators of the universal fuel supply system.

Keywords: automobile, engine, ecology, safety, power, efficiency, natural gas fuel, gas cylinder equipment, universal supply system.

INTRODUCTION

It is known that road transport plays an important role in the development of the country's economy. To further stabilize the economy, it is necessary to increase and improve the production structure of cars that emit less harmful substances into the environment, as well as high fuel efficiency. Today, low-cost natural gas engines are widely used in modern urban vehicles. It uses natural, industrial and synthetic gases in compressed or liquefied state. Because natural gas, which is used as a motor fuel, has many advantages over petroleum products. In their usage, high technical and economic performance of the engine is achieved, because natural gas has very good antidetonetic properties, the property of forming a mixture with air is very good. When the engine is running on gaseous fuel, the mixture burns almost completely and the environment is less polluted as the toxicity of the exhaust gases is much lower. As a result, about 70-80% of cars in the country run on natural gas.

Compressed natural gas is normally gaseous at any pressure and contains mainly methane and hydrogen. The use of gases eliminates the washing of the oil film from the walls of the pistons and sleeves, reduces the formation of dryness in the combustion chambers, the oil in the walls of the cylinder liners does not burn due to the absence of gasoline vapors, resulting in engine life and oil change period 1.5 -2 times longer. The use of gaseous fuel reduces the total amount of harmful carbon monoxide, nitrogen dioxide and hydrocarbons in the exhaust gases emitted from the engine [3].

The toxicity of the exhaust gases is 3 times less than when working with gasoline

when burning gaseous fuel, the level of noise from the engine when choosing the right operating mode is low, and this is especially important in urban conditions. Therefore, a lot of work is being done to convert cars to gas and improve gas cylinder equipment [12].

LITERATURE REVIEW AND METHODOLOGY

The world's leading scientists and researchers have done a lot to improve the transition of vehicles to gas, as well as to improve the supply system of cars running on gas.

In our country, too, there are a number of normative and legal documents on the organization of safe operation of cars with gas cylinders, which set special requirements. Including:

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 30 of February 10, 2007 sets out strategic directions for the conversion of vehicles of individuals and legal entities in the country for liquefied and compressed gas for the period 2007-2012, as well as for the construction of liquefied and compressed gas supply stations [1].

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 815 of October 11, 2017 has approved additional measures to develop a network of compressor stations for gas filling of vehicles and the gradual transfer of vehicles to compressed natural gas, as well as to ensure the safe operation of gas cylinder equipment.The resolution outlines additional measures to develop a network of gas filling compressor stations to ensure the safe operation and improvement of gas cylinder equipment [2].

K.M. Siddiknazarov and U.V. Ahmedovs' book on the topic "Motor transport of Uzbekistan in the past and the years of independence" was dedicated to this sphere.This book contains information on motor transport and ecology, the emergence of motor transport, motor transport of Uzbekistan until the years of independence [3].

N.G. Pevnev, A.P. Yelgin, L.N. Bukharov wrote "Technical operation of gas cylinders". This book provides information on the use of gas-cylinder vehicles and the use of gas fuel as a fuel for automobiles [4].

Panov Yu.V's book is "Installation and operation of gas cylinders for automobiles" [5]. This manual provides information on the methods and equipment for installing gas cylinder equipment in cars [11].

B.I. Bazarov's dissertation "Scientific basis of energy and ecological efficiency

of the use of alternative fuels" provides and substantiates the ecological efficiency of the use of alternative fuels for vehicles [6].

The information presented in the article is analyzed using the results of research conducted by scientists working in this field and the necessary scientific and technical information obtained through Internet sites.

RESULTS

The number of vehicles running on natural gas in the country is growing year by year, and various types of vehicles, such as heavy-duty vehicles, adapted for agricultural work and special work are also used for gas [9]. Below are the statistics of legal entities and individuals on the conversion of vehicles to compressed natural gas in 2017-2019 (Table 1).

Statistics of legal entities and individuals on conversion of vehicles to compressed natural gas (2017-2019)

Table 1

№	Names of regions	2017		2018		2019		Total for 2017 - 2019	
		legal entities	individuals	legal entities	individuals	legal entities	individuals	legal entities	individuals
1.	Republic of Karakalpakstan	1 035	8 280	2 624	15 998	838	16 750	**4 496**	**41 028**
2.	Andijan region	972	2 898	2 253	5 759	3 350	9 213	**6 575**	**17 870**
3.	Bukhararegion	1 242	12 420	2 880	28 796	1 843	29 313	**5 964**	**70 528**
4.	Jizzakh region	212	1 408	491	2 560	754	4 188	**1 457**	**8 155**
5.	Kashkadarya region	1 656	12 834	4 159	27 516	838	31 825	**6 653**	**72 175**
6.	Navoiy region	1 035	3 726	2 560	7 679	1 089	13 400	**4 683**	**24 805**
7.	Namangan region	1 035	4 140	2 240	9 599	1 591	11 306	**4 866**	**25 045**
8.	Samarkandregion	1 321	18 630	2 560	38 394	1 843	49 413	**5 723**	**106 437**
9.	Surkhandaryaregion	1 035	7 411	2 240	12 798	1 424	19 430	**4 698**	**39 639**
10.	Syrdaryaregion	281	828	651	1 280	1 424	419	**2 356**	**2 527**
11.	Tashkent region	1 656	10 764	3 839	19 197	1 675	33 500	**7 170**	**63 461**
12.	Fergana region	1 656	13 662	4 159	25 596	1 508	64 488	**7 323**	**103 746**

13.	Khorazm region	952	5 796	1 920	8 319	1 843	31 825	**4 714**	**45 940**
14.	Tashkent city	6 210	26 910	12 798	51 192	2 596	12 730	**21 604**	**90 832**
	Across the country	**20 298**	**129 706**	**45 373**	**254 680**	**22 613**	**327 798**	**88 283**	**712 184**
	TOTAL	**150 004**		**300 054**		**350 410**		**800 467**	

The operation of the supply system of gas-powered engines was studied and the causes of their failures were analyzed. As a result of these analyzes, it became clear that 85% of their faults were with the gas dispenser, 5% with the gas cylinder valve, 4% with the solenoid valve, 3% with the gas reducer and 3% with other types of faults [8].

The growing number of vehicles running on compressed natural gas, in turn, requires the improvement of their fuel supply system.

The conversion of modern injector engines to gaseous fuel is carried out in two ways. The first method is to equip a standard injector engine with gas cylinder devices and create a gas modification of it. In this case, the engine will be able to run on both gasoline and gas. At the same time, when the engine reaches full power in gasoline, the power decreases slightly in gas. The second method is to create a special gas engine that reaches full power on gaseous fuel. The efficiency of such engines is significantly improved due to the increased compression ratio and the installation of a gas mixer [7].

The operating cycle of a gas engine is almost no different from that of a gasoline engine.

Currently, gas appliances installed on gas-powered cars can be divided into the following 4 generations:

1st generation gas cylinder equipments. The first generation of gas cylinder equipment appeared in the 1970s, and it was designed for carburetor engines.To date, this generation of equipment is considered obsolete, so manufacturers have moved to modern versions of gas equipment.

2nd generation gas cylinder equipments. Carburetor engines were replaced with injector engines, and manufacturers initially tried to adapt gas equipment to new injector vehicles without changing the design. Second-generation gas appliances work the same as Generation 1, but have been replaced by a solenoid valve instead of a vacuum valve. The solenoid valve allows you to switch from one fuel type to another using the button to select the desired type of fuel.

3rd generation gas cylinder equipments. It started with the emergence of

serious changes in the operation of gas appliances in cars. The main difference of the 3rd generation GA from previous generations was the emergence of an electronic system for controlling and adjusting the fuel supply. This generation of equipment is installed in cars equipped with an electronic control unit and controlled by an electronic control unit, which has resulted in reduced fuel consumption and increased efficiency, as well as reduced emissions.

4th generation gas cylinder equipments. It is the most common version of gas appliances today (90 percent of car owners prefer this system). Despite its relatively simple structure, it has excellent technical properties. A distinctive feature of this generation from the previous ones is the presence of an injector for each cylinder, which provides the gas mixture required for high-power operation of the engine. The operation of the separate injectors is controlled by an electronic control unit and is called a universal supply system. This gas appliance ensures high engine efficiency (up to 50%) with low power loss.

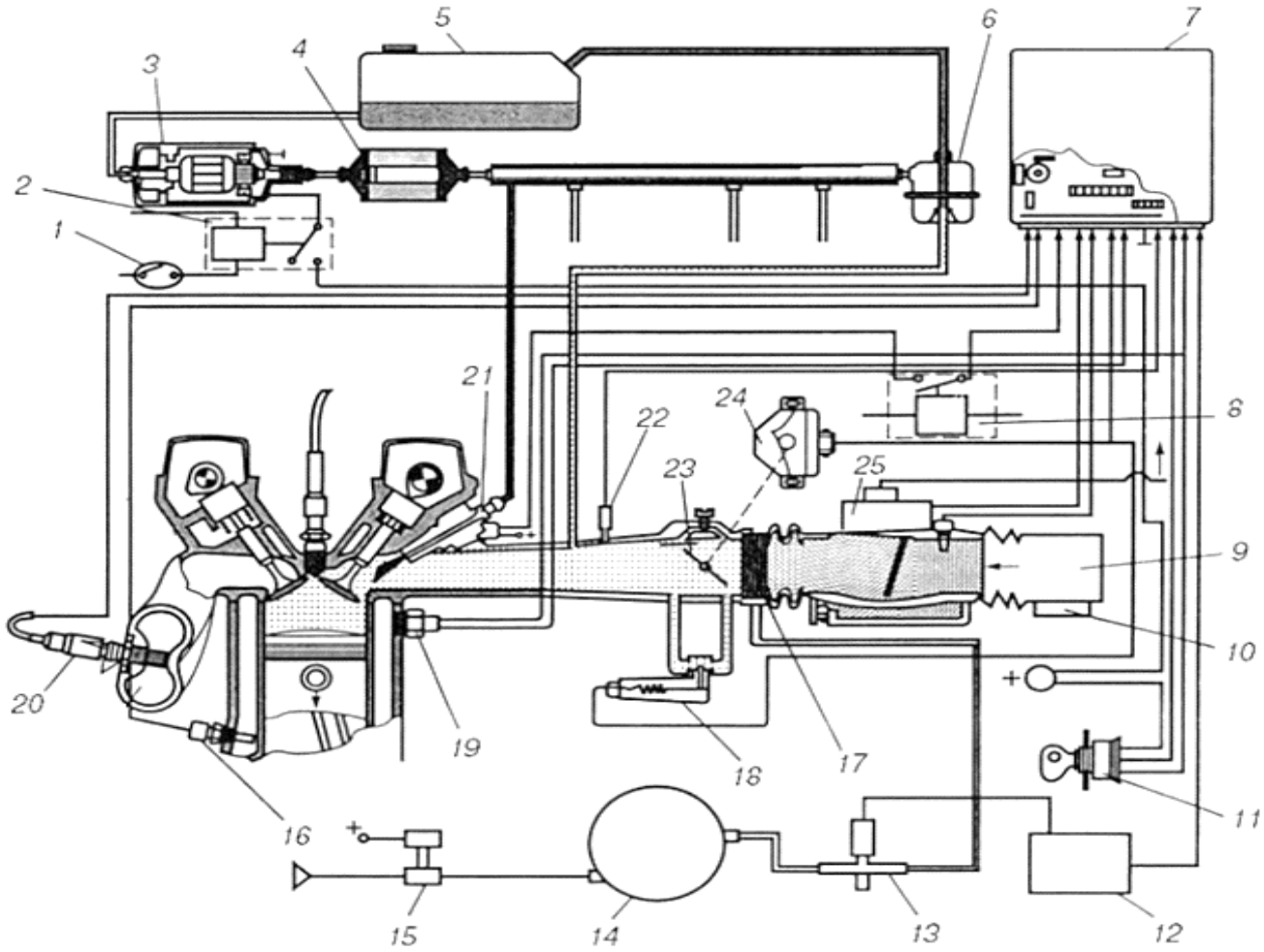
DISCUSSIONS

Today, the fuel supply system for gas-powered cars is much improved, and cars are equipped with several modern types of gas equipment. To increase the power of gaseous engines, it is necessary to switch their supply system to a universal or combined supply system.

In general, gas-powered engine supply systems are designed to run on a single fuel and several (usually two) fuels. Single-fuel supply systems run on only one type of fuel, such as gas, gasoline, or diesel. In turn, a supply system operating on several fuel types is divided into universal (scheme "or") and combined (scheme "and") types according to the methods of using different types of fuel [10].The operation scheme and principle scheme of the universal gas supply system are as follows (Figure 1).

1 – "Gasoline-Gas" conductor 2 – benzo pump relay; 3 – benzo pump; 4 – fuel filter; 5 – gasoline bank; 6 – pressure regulator; 7 – electronic control unit; 8 – injector relay; 9 – air filter housing; 10 – safety valve; 11 – ignition key; 12 – electronic block; 13 – gas dispenser; 14 – low pressure reducer; 15 – solenoid valve-filter; 16 – coolant temperature sensor; 17 – gas mixer; 18 – salt processing valve; 19 – detonation sensor; 20 – lambda-probe; 21 – gasoline injectors; 22 – air temperature sensor; 23 – drossel zaslonkasi; 24 – throttle valve status sensor; 25 – air flow meter.

Figure 1 is a schematic diagram of a universal supply system.



The following are the advantages of a universal supply system (Figure2).

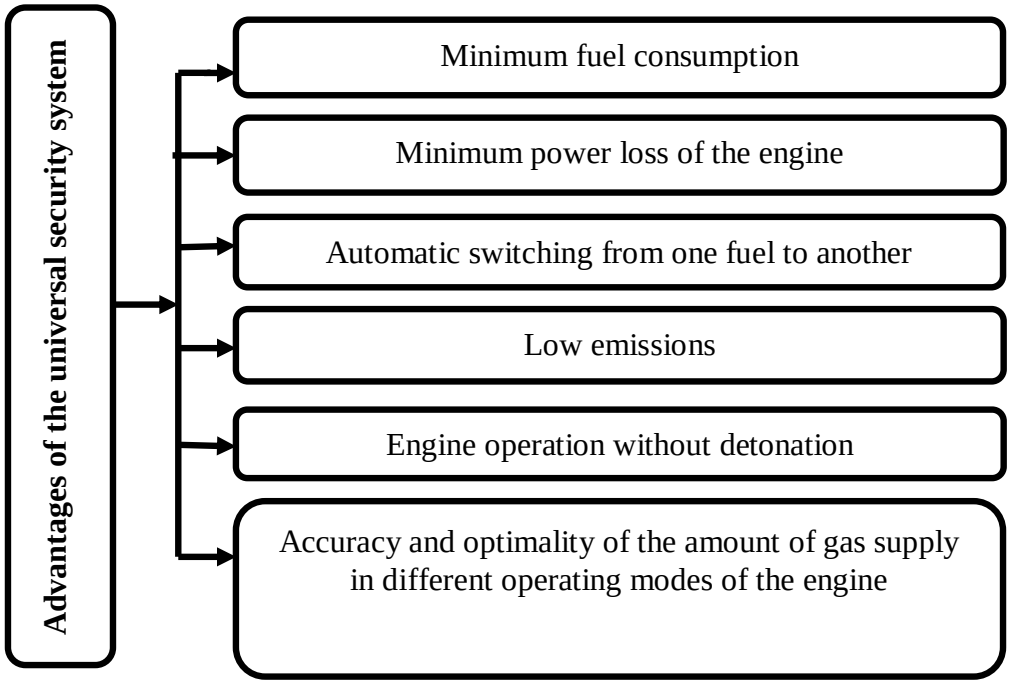


Figure 2. Advantages of a universal supply system.

CONCLUSION

This supply provides the system with the gas mixture needed to run the engine at high power. Installation of gas equipment with a universal and combined supply system will increase engine power, distribute the fuel mixture evenly for each cylinder, reduce fuel consumption due to the accuracy of the fuel transfer dose, and release toxic gases into the environment,which leads to a decrease in the volume, improvement of the dynamic properties of the engine (vehicle), reliable start of the engine and rapid achievement of the normal operating mode of the engine. Improvement of the automotive industry in the country will result in a fourfold reduction in harmful gases and 70% savings in oil products.

In order to achieve high efficiency and reduce the amount of toxic gases emitted into the air, it is advisable to equip cars with gas equipment operating in a modern universal and combined supply system to ensure a high level of engine power.

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