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Diagnostic parameters for the assessment of transmissions performance

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The automotive industry is one of the leading types of heavy industry in Belarus. Since the days of the Soviet Union heavy trucks have been constructed and produced here. Modern models of cars have also been assembled in recent years. At present, the company UNISON has established the assembly of some cars. This is primarily "Geely" and a model range of "Peugeot". The assembly of models, such as Opel Mokka, Chevrolet Traxx and even Cadillac Escalade, belonging to General Motors group, is carried out.

A modern car consists of the following elements: an engine, a chassis and a body. An engine is a source of mechanical energy. A chassis is a set of units for vehicle movement and control, for transmitting mechanical power from an engine to wheels. A body is a bearing part of a car.

The transmission is a part of a chassis, which is used to transmit torque from the engine to the wheels. A gearbox is the main unit of a car's transmission. There are several common types of gearboxes: manual, automatic, robotized.

Currently in Europe manual gearboxes dominate and in the USA and Japan – automatic gearboxes. Both types of gearboxes have specific advantages and disadvantages.

The advantages of manual gearboxes are the following:
simplicity of the device,
reliability,
weight,

fuel economy.

The disadvantages of manual gearboxes are the following:

discomfort when shifting,

distraction of a driver.

The advantages of automatic gearboxes are the following:

driver's comfort,

less engine wear,

smooth shifting.

The disadvantages of automatic gearboxes are the following:

complexity of a design,

increased fuel consumption.

A robotized gearbox is a conventional manual gearbox with automatic gear shift. For a driver gear shifting can be performed in automatic and manual modes. This type of a transmission combines the comfort of an automatic transmission and reliability and fuel efficiency of a manual transmission.

The investigations of gearboxes are going on continuously. The characteristics of a gearbox, such as efficiency, performance, complexity and weight are as important as the main characteristics of an engine. In 2005 Volkswagen engineers developed a fundamentally new robotized gearbox DSG (Dual Shift Gearbox) with gear shifting without power flux gap. This formed the framework for Volkswagen to combine transmission concepts into one completely new gearbox generation: the direct shift gearbox. This type of a gearbox is called robotized. But it is classified as an automatic. The number of automotive vehicles, which are equipped with a robotized transmission is continuously growing.
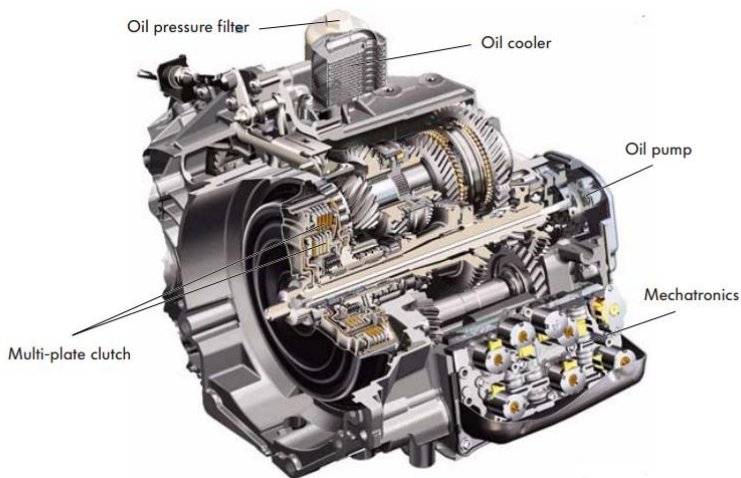
Fig. 1 – Construction of DSG

Thanks to a double multi-plate clutch design and different automatic gear selection programmes, it is capable of meeting the high demands in comfort from drivers who favour automatic gearboxes. Furthermore, with direct selection and lightning fast, jolt-free gear changes, it also offers a high level of driving enjoyment to drivers who favour manual gearboxes. In both cases, fuel consumption is at a par with economical vehicles fitted with manual gearboxes [1].

Robotized gearboxes are widely used in foreign cars and trucks, which are operated in Belarus. While repairing robotized transmissions a modular method is often used. This method implies the replacement of the whole module which increases the cost of repairs. The use of up-to-date methods of diagnostics (such as computer diagnostics, stand diagnostics or complex diagnostics) can help us to find malfunction faster and more precisely.

The main problems in this field of research are how to increase the accuracy of diagnostics and to decrease the cost. Thus very promising is to develop the algorithm of prediction of gearbox work on the basis of the data obtained during diagnostics.

To achieve this aim it is necessary to fulfil the following tasks:

• to determine the list of parameters of a gearbox;

• to choose the major parameters, which are required for diagnostics;

• to predict future work of a gearbox.

References:

1. Direct Shift Gearbox 02E. Self-study programme 308 [Electronic resource]. – Mode of access: http://vwts.ru/vw_doc2/trans/02e/dsg_02e_rus.pdf. – Date of access: 10.03.2017.