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Determining Parameters of Crank-and-rod Mechanism of the Internal Combustion Engine

Crank-and-rod mechanism (CRM) consists of fixed parts (block of cylinders, crank bearing, the head of the blocks of cylinders). As for block of cylinders, pistons equipped with piston rings carry out progressive motion. Piston is connected with piston-rod by piston pin passing through the connecting-rod head. The low head is dismountable and embraces crankshaft connecting rod journal through dismountable boxes. To perform the functions of the friction bearing within kinematic pair “piston-piston rod” it is required to ensure definite space between sliding surfaces. The same problem should be solved while assembling kinematic pair “piston rod-shaft”. Thus, to reach passport figures of the operational process it is required to determine not only high precision of the manufacturing components themselves, their geometry, but also kinematic precision of the link joint of crank-and-rod mechanism. It will guarantee parallelism of three axes (piston pin, crank pin, crankshaft main bearing).

The aim of the study is to ground parameters of technical decision of jointing kinematic pair “piston-piston rod” of the crank-and-rod mechanism that enables to eliminate defects.

The presence of the gap spacing in the system of the crank-and-rod mechanism leads to the piston-rod misalignment that determines point contact of the piston pin and the crank pin with the sliding bearing. Furthermore, geometry of the contact of the piston with block cylinder is changed. In the points of interaction of kinematic pair elements, heating of the contact surfaces and their wearing take place due to the large specific pressure. For this purpose special coating is applied on the sliding surface of the elements. It reduces friction coefficient. Special lubricants are used. However, due to the high contact pressure and temperature the breakdown of the fluid film takes place. The elements are working in semifluid lubrication rate. It leads to the element geometry change. The increase of the gap spacing between sliding surfaces leads to the compression, power, consumption of fuel and lubrication materials decrease.

Thus, complicated and expensive manufacturing process and the hard conditions of maintaining crank-and rod mechanism require high precision of production facilities while manufacturing links and elements of kinematic pairs.

This technical decision enables to increase local mobility of kinematic pair “piston-piston rod” of the crank-and rod mechanism due to reducing the influence of the negative factors of the operational process.