

Aleksey Juravel
G.K. Vanja, research supervisor
T.I. Morozova, language adviser
SHEI “National Mining University”, Dnipropetrovsk

Substantiating Selection of the Steel Grade for the Pins of the Crank-and-rod Mechanism

Crank-and-rod mechanism serves to transform progressive motion of the piston into rotational motion of the crank shaft and vice versa.

The elements of the crank-and-rod mechanism are divided into movable (piston, piston pin, piston-rod, crank shaft, wheel) and fixed (block of cylinders, the head of cylinder block, crankcase).

Piston pin connecting piston with the upper rod head is the most important element.

Piston pin is the axis in the pin joint with of the piston with the piston rod and receives all power loads. Power loads on piston pin within four-cycle engine are sharply changed in value and direction, and within two-cycle engine only in the value. In both cases piston pins are subjected to the striking character of load application in conditions of limited lubrication. Piston pins should have as little mass as possible. Taking into account constructive considerations they are manufactured with limited cross-section and small supporting surface. It leads to increased stresses and considerable specific pressures on supporting surfaces of the pin joints. That is why they are produced in the form of the hollow cylinder with the small wall thickness of the same or variable cross-section along the axis. Piston pin should be strength, light and wear resistant. Pins are produced from the high quality low-carbon steel. Within specially stressed engines high expensive chromous alloyed steel 18XГТ, 12XH3A, 20XГTP, 20XHM, 20X2H4A is used..

After chemical and thermal treatment material of the pin from the internal side of the wall keeps viscose properties, is well resistant to impact loads and external hardened layer has increased wear resistance. Then the material is carefully smoothed , polished to remove the traces of treatment from the working area caused by concentration of dangerous strong local stresses. Technological defects are the most widespread. So, it will take 15-16 hours to carry out chemical and thermal treatment . This process is energy and labor intensive. Given method of thermal treatment of carbon steel enables to choose the steel 55 of decreased hardening capacity as the material of the pin of the crank-and rod mechanism.