Fe-Cu powder details: surface condition and wear resistance

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Abstract.

Surface condition of powder details on the different stages of producing of joining elements is the important factor that influences on the choice of technological conditions of operations and end-use properties and running ability of product. Generally, the roughness, porosity and microstructure determine the surface condition. The results of investigation of surfaces and wear resistance of iron-copper details after compacting, sintering and infiltration are offered.

The influence of the technological process on the surface conditions was evaluated by comparison of the average 2D and 3D roughness parameters of iron-copper details after compacting, sintering and infiltration. The present surface roughness research is based on machine parts surface cross section profile analysis. But in practical applications machine parts surface roughness behaves as a 3D object. Therefore it is necessary to create a new theoretical and practical basis for machine parts surface assessment as a 3D quantity. Therefore, the "Taylor Hobson Ltd" 3D measurement system has been used. The analysis of the influence of the technological process on the surface roughness parameters is given.

It was established, that the values of 2D amplitude parameters and 3D amplitude and spatial parameters are increased during technological process: compacting, sintering and infiltration by copper of powder details. Especially significant changes occur with 3D spatial parameters: density of summits (Sds) increases in three times during compacting, sintering and infiltration. An important point is that at the same time surface is more and more anisotropic since the value of parameter Str closer to 1. The reason for these changes of surface conditions is shrinkage of material during sintering and infiltration. So we can use measurement results not only for evaluation of details quality, but for prediction of shrinkage and consequently for pressing equipment design and choosing of sintering regimes.

Based on the obtained surface roughness parameters and physical-mechanical properties the wear resistance was calculated using new approach offered by authors. Analytical values show well accordance with practical values.