

Summary

The automotive industry is constantly looking for ways to reduce production defects, which results in activities aimed at understanding and eliminating the causes of imperfections. In relation to tight inseparable joints for refrigeration systems, it is required to conduct multi-criteria research allowing for the correct selection of the joint forming technology as well as the functional features of the surface allowing to meet the required and previously determined leakage value.

The aim of the doctoral thesis was to compare and assess of chosen selected topography parameters, further to identify parameters affecting obtaining the leakage value in a defined area. The second aim of the dissertation was to manufacture a tight, inseparable connection without the use of additional sealing accompanied with tests and assessment of the influence of the joint geometry on its selected functional features.

The research in the thesis analyzed several parameters determining the surface topography of the tested samples in terms of the impact on the obtained interfacial leakage, i.e. *Sa, Sq, Sp, Sv, Sz, Ssk, Sku, Sal, Sdq, Sdr, Smr, Smc, Sdc, Smr1, Smr2, Spk, Sk, Svk, Vm, Vv, Vmp, Vvc, Vmc, Vvv, Std, Spd, Spc, S5p, S5v, S10z, Sda, Sha, Sdv, Svd, Svc* and *Shv*. As a result of conducted analysis, the relationship between the parameters of the surface topography and the functional property of the surface (tightness) was confirmed. For experimental conditions defined in the dissertation, the relationship was observed for the parameters *Sdq, S5v, Sv, S5p, Sp, S10z, Sz, Vv, Vvc, Vmc, Sk, Smc (mr), Sa, Sq, Sdr* and *Spk*.

In order to conduct research aimed at manufacturing a tight inseparable joint without an additional seal using one of the two methods of forming joints, a prototype device generating a determined load and displacement was designed and manufactured, as well as forming tooling. In the dissertation was analyzed the influence of the geometry of the made inseparable joint on the forces required to manufacture it, on its strength and tightness, for the values of the diameter of the connector block flange and the flange wall thickness determined in the thesis. The relationship between the strength and the tightness of the formed joint and the thickness of the formed wall was shown. As the thickness of the wall was decreased, there was an increase in the reported leakage value and a decrease in tensile strength.

The performed research confirmed the possibility of making inseparable joints without the use of additional sealing with a determined leakage value with use of the forming tool in form of a cylindrical part with a recess in its center. Regardless of the thickness of the formed wall, the value of the obtained leakage remained at the determined level, i.e. 10^{-6} mbar•l/s.