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# Experimental determination of residual stresses in the hard-faced layers after hard-facing and tempering of hot work steels

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**Abstract**

The procedure for experimental determination of the longitudinal and lateral residual stresses in the multi-layer hard-faced plates, made of the hot work tool steel used for forging dies manufacturing, is presented in this paper. The objective of this research was to establish the influence of the multi-layer hard-facing on residual stresses in the thin and thick plates, which could later, in exploitation, cause the appearance of cracks and fracture. The influence of tempering on decreasing the residual stresses was monitored, as well. The plates were hard-faced in three layers, while the stresses were measured by the magnetic method. The obtained results have shown, among others, that the residual stresses are higher in the thick plates, as well as that the proper regime of the heat treatment can significantly reduce the level of residual stresses.

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*Keywords:* hard-facing; hot work tool steel; residual stresses; tempering;

**Nomenclature**

| | |
|---|---|
| s | plate thickness |
| $d_e$ | electrode diameter |
| I | hard facing (surfacing) current |
| U | hard facing (surfacing) voltage |

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