

Procedia Engineering, 2017, vol.206, pages 1348-1354

---

# Automated Generation of Rational Sheet Metal Forming Technology Variants at Process Engineering Stage

Kashapova L., Pankratov D., Shibakov V.  
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

---

## Abstract

© 2017 The Authors. Published by Elsevier Ltd. The procedure of automated process reliability evaluation was developed in order to prevent recurrent defects in parts manufactured by die stamping. The procedure is based on the analysis of such factors as part design, material, its mechanical and physical properties; equipment parameters, tool performance, etc. The list of reliability factors may vary according to a type of operation as deformation process is different for each group of operations. The adjustment of stamping process reliability performance prevents any defects emerging during production of critical parts as early as the PPE stage. The automated control system for IE design at the PPE stage provides better part quality and lower production expenses thanks to IP reliability.

<http://dx.doi.org/10.1016/j.proeng.2017.10.643>

---

## Keywords

control, expert system, industrial process, reliability, stamping

## References

- [1] L.R. Kashapova, D.L. Pankratov, and V.G. Shibakov Procedure of automatic reliability evaluation for stamping process at its design stage *Fundamental Research* 8 7 2014 1533 1538 (in Russ.)
- [2] L.R. Kashapova, D.L. Pankratov, V.G. Shibakov, and A.I. Vinogradov Quality control for complex parts at the stage of stamping process design *Journal of Machinery Manufacture and Reliability* 1 2016 81 86 (in Russ.)
- [3] V.G. Shibakov, L.A. Simonova, R.I. Mulyukov et al., Intelligent system for generation of stamping plant processes on the basis of CALS technology, *Academia Publ., Moscow*, 2011, 220 p. (in Russ.)
- [4] GOST 27.002-89, Industrial product dependability. General concepts. Terms and definitions (in Russ.).
- [5] V.G. Kovalev Technology of sheet metal forming 2010 *KnoRus Moscow* 224 (in Russ.)
- [6] S.A. Elenev Cold stamping 1988 *High School Moscow* 271 (in Russ.)
- [7] E.I. Semenov Forging and stamping: The guide, Vol. 4, Stamping 1987 *Mechanical engineering Moscow* 544 (in Russ.)
- [8] V.P. Romanovskiy Handbook of cold stamping, *Mechanical engineering* 1979 Saint Petersburg Moscow 782 (in Russ.)
- [9] V.I. Goryaynov Cold stamping equipment and its commissioning 1988 *Higher School Moscow* 256 (in Russ.)
- [10] L.I. Rudman, V.L. Marchenko, A.I. Zaychuk, Stamps designer handbook, Stamping, *Mechanical engin., Moscow*, 1988, 496 p. (in Russ.).
- [11] T.A. Egorova 2004 *Mechanical engineering enterprises production organisation Saint Petersburg* 304 (in Russ)
- [12] L.R. Kashapova, D.L. Pankratov, R.F. Utyaganov, Control of die stamping process reliability on the basis of intelligent system, in *Proc. 8-th Russian National Conf. of Young Researchers and Experts-Future of Machine-Building Industry in Russia*, 2015, pp. 182-185 (in Russ.).

- [13] L.R. Kashapova, Control of stamping process reliability for complex parts at the design stage, in Proc. Russian National Applied Science Conference of Students, Postgraduates and Young Researchers - VII Kama Readings, 2015, pp. 100-102 (in Russ.).
- [14] H.A. Fashiev, and I.D. Valeev Differential method of assessing the quality of hire Moscow, Automobile industry 11 2007 3 7 (in Russ.)
- [15] L.R. Kashapova, D.L. Pankratov, R.F. Utyaganov, Influence of contact friction on stability of stamping process, in Proc. International Scientific Technical Conference - Engineering and Technologies Development Trends, 2015, pp. 54-60 (in Russ.).
- [16] Li Zhenzi, Wang Hui, Zhou Hongbiu, and Li Huijian A mixed method of determination the thermal stress for cold roller Journal of Central-South University of Technology 4 2 1997 100 103
- [17] V.B. Ginzburg, F.A. Bakhtar, and R.J. Issa Application of Cool flex model for analysis of work roll thermal conditions in hot strip mills Iron and Steel Engineer 74 11 1997 38 45
- [18] S.R. Wang, and A.A. Tseng Macro and micromodeling of hot rolling of steel coupled by a micro constitutive relationship Iron and Steelmaker 23 9 1996 49 61
- [19] V.M. Glushkov Forecasting on the basis of expert estimations Cybernetics, Kiev, Scientific thought 2 1970 2 4 (in Russ)
- [20] V.M. Zuev Heat treatment of metals: textbook for technical schools 1981 Higher School Moscow 296 (in Russ.)