Identification of Stress and Structure Properties in Surface and Subsurface Layers of Nuclea Reactor Austenitic Steel

Andrej Czán, Anton Martikáň, Jozef Holubják, Jozef Struhárňansky
University of Zilina, Faculty of Mechanical Engineering, Univerzitna 1, 010 26, Zilina, Slovak Republic
dana.stancekova@fstroj.uniza.sk, jan.semcer@fstroj.uniza.sk, michal.sajgalik@fstroj.uniza.sk

The article deals with non-destructive measuring and evaluation of residual stresses and chemical properties of stainless steel sample and its possibility to affect functional properties of the material. X-ray diffractometry can accurately determine values of both residual stress and austenite percentage. Due that this method of measuring is non-destructive, it is possible to ensure measure repeatability and measured component is able to keep its original function. Monitoring of residual stresses in components can be useful in predicting damage incidences due to workload over lifetime of components and together with austenite volume it can also be used as evaluation parameter of suitability of applied manufacturing technological operations.

Keywords: Residual stress, austenite volume, stainless steel, X-ray diffraction

Acknowledgement

This work is related to the project with the University of Zilina, 2009/2.2/04-SORO OPVaV number (26220220101). Name project is intelligent system for nondestructive evaluation technologies for functional properties of components of X-ray difractometry ".

References

[1] GRIFFITHS, C. A. (1989). Closing the Loop on Product Integrity on Bearings with Engineered Source Approval, *Split Ballbearing Features*, Company Newsletter

[2] TIITTO, K. et al. (1991). Testing Shot Peening Stresses in the Field, The Shot Peener, vol. 4, ISSN. 1069-2010

[3] PREVÉY, P.S. (1986). X-ray Diffraction Residual Stress Techniques, *Metals Handbook 10,* Metals Park: American Society for Metals, p. 380-392.

[4] FITZPATRICK, M.E. et.al. (2005). Determination of Residual Stresses by X-rayDiffraction. *MeasurementGood Practice* No. 52. National Physical Laboratory, Teddlingtoon.

[5] BREZINA, M., KUPCA, L. (2008). Stress corrosion cracking of austenitic stainless steel in a nuclear power plant enviroment. *Enviromentinducted cracking ofmaterials*. Department of Structural Analysis, VUJE Inc, Trnava, p. 431 – 436

[6] SADÍLEK, M., KRATOCHVÍL, J., PETRŮ, J., ČEP, R., ZLÁMAL, T., STANČEKOVÁ, D. (2014) Cutting tool wear monitoring with the use of impedance layers. In. *Tehnicki Vjesnik*, Volume 21, 2014, Pages 639-644

[7] CEP, R., JANASEK A., PETRU J., CEPOVA L., CZAN A., VALICEK J. (2013) Hard Machinable Machining of Cobalt-based Superalloy. *In ManufacturingTechnology XIII/13* . UJEP: Ústi n. Labem. p. 226-231. ISSN 1213-2489

[8] SAPIETOVA, A., SAGA, M., NOVAK, P. (2012). Multi-software Platform for Solving of Multibody Systems Synthesis, *Comunications*, vol. 14, No. 3, 43-48, 2012, ISSN 1335-4205

[9] MOHYLA, P., TOMČÍK, P., BENEŠ, L., HLAVATY, I. (2011) Effectof post-welding heat treatment on secondary hardening of welded joints of Cr-Mo-v steel. *Metal Science and Heat Treatment* 53 (7-8), pp. 374-378. ISSN: 0026-0673.

[10] CZAN, A., TILLOVA, E., SEMCER, J., PILC, J. (2013). Surface and subsurface residual stresses after machining and their analysis by x-raydiffraction. In. *Komunikacie*, Volume 15, Issue 2, 2013, Pages 69-76. ISSN 1335-4205

[11] STANČEKOVÁ, D., ŠEMCER, J, DERBAS, M, KURŇAVA, T. (2013), Methods of measuring of residualstresses and evaluation of residual state of functional surfaces by x-ray diffractometric methods.In: *Manufacturing technology*. Vol. 13, no. 4 (2013), s. 547-552

[12] VASILKO, K., PILC, J. (2013). New technological knowledge of the rotary turning tool, Journal*Manufacturing Technolog*y, Volume 13, Issue 4, December 2013, Pages 571-575, ISSN: 1213-2489

[13] MICHALIK, P., ZAJAC, J., HATALA, M. (2013). Programming CNC machines using computer-aided manufacturing software, *Advanced Science Letters*Volume 19, Issue 2, February 2013, Pages 369-373, ISSN: 19366612

[14] CEP, R., KOURIL, K., MRKVICA, I., JANASEK, I., PROCHAZKA, J. (2010). Zkoušky nastroju Kyocera v podminkach prerusovaneho rezu. In. *Strojirenska technologie,* vol. XV, 2010/3, pp. 51-58, ISSN 1211-4162.

[15] LITVAJ, I., PONIŠČIAKOVÁ, O., STANČEKOVÁ, D., DRBÚL, M. (2013). Knowledge processes and their implementation in small transport companies, *17th International Conference Transport Means* 2013; Kaunas; Lithuania; 24 October 2013 through 25 October 2013; Code 102486, pages 153-156, ISSN: 1822-296X

[16] HOLESOVSKY, F., NAPRSTKOVA, N., NOVAK, M. (2012). GICS for grinding process optimization. In *Manufacturing Technology* XII/12. 2012. UJEP: Ústi n. Labem. p. 22-26. ISSN 1213-2489.

[17] ČEP, R., JANÁSEK, A., ČEPOVÁ, L., PETRŮ, J., HLAVATÝ, I., CAR, Z., HATALA, M. (2013). Eksperimentalno ispitivanje rezne sposobnosti izmjenjivih reznih In *Tehnicki Vjesnik* 20 (1) , pp. 21-26. ISSN: 1330-3651

Paper number: M201449