UNIVERSITY OF ŽILINA IN ŽILINA
Faculty of Mechanical Engineering
Department of Materials Engineering

SEMDOK 2012

17th International of PhD. students' seminar

under the auspices of
prof. Ing. Štefan Medvecký, PhD.
dean of the Faculty of Mechanical Engineering of the University of Žilina in Žilina

Žilina – Terchová, Slovakia
25 – 27 January, 2012

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SEMDOK 2012 – the 17th International of PhD students' and scholar's seminar (CZ, D, H, PL, SRB, SLO, SK) is aimed to provide the young scientists with an encouraging, stimulating environment in which they present and discuss the results of their research activities. SEMDOK 2012 is traditional European international seminar from the Materials Engineering and Threshold State of Materials. It has a tradition of being held since 1996. It is organised for PhD students and scholars every year. The seminar will last for three days. Seminar languages are English, Slovak and Czech. Each participant will obtain proceedings from the seminar. The selected papers accepted by Scientific Committee will be published in the Materials Engineering Journal – SK (in English).

♦

Welcome, we hope you are going to have a pleasant stay at Žilina - Terchová, Slovakia.

Organizing committee

4. Impact of experiment configuration on Göken - Riehemann ADIF spectrum

Internal friction connected with cracks or fatique is an extreme case of hysteretic damping. A simple rheological model taking into account the crack origin of damping was developed by Göken and Riehemann [3]. When the stress amplitude is lower than the critical ε_{cr}, the crack is closed and does not contribute to the IF. When the stress amplitude is higher than ε_{cr}, the contribution of crack to the IF consists of two parts

$$\eta(\varepsilon)=\frac{\alpha}{\varepsilon^2}+\beta f^2, \qquad (7)$$

first one described by Göken-Riehemann model [3] with IF reciprocal to second power of stress amplitude, second one proportional to the second power of frequency f [5]. The parameters α, β depends on crack size. A comparison of material ADIF and measured ADIF spectra expected for different measuring situations is done in Fig. 4.

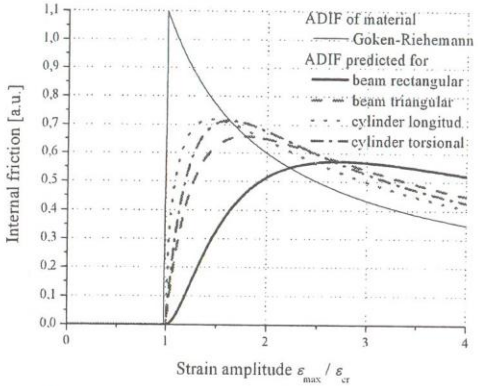

Fig. 4. Impact of experimental configuration on measured spectrum. Specimen with homogeneously distributed cracks

5. Conclusion

Calculation of ADIF is shown to be possible for flexural fundamental vibrations of single clamped bending beams of rectangular and triangular shape and fundamental axial as well as torsional vibrations of cylinders if the internal friction was measured as a function of maximal strain. On the other side, these measurements, expected from amplitude dependent damping models can be predicted. As can be expected the inhomogeneous strain in the samples smoothes the ADIF-curves for homogenous strain.

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COMPUTER CONTROLLED EXPERIMENTAL DEVICE FOR INVESTIGATIONS OF TRIBOLOGICAL INFLUENCES IN SHEET METAL FORMING

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Summary

Sheet metal forming, especially deep drawing process, is influenced by many factors. Blank holding force and drawbead displacement are two of them that can be controlled during the forming process.

For this purpose, electro-hydraulic computerized sheet-metal strip sliding device has been constructed. Basic characteristic of this device is realization of variable contact pressure and drawbead height as functions of time or stripe displacement. There are both, pressure and drawbead, ten linear and nonlinear functions. Additional features consist of the ability to measure drawing force, contact pressure, drawbead displacement etc.

Presented in the paper are the device overview and the first results of steel sheet stripe sliding tribological physical model.

Key words: *deep drawing, drawbead, variable contact conditions, tribology*

1. Introduction

Technology of deep drawing of thin sheet metals is very important in modern industry. Due to the development of new materials of more complex formability and raising of the technological requirements to the higher level, the need for realisation of complete control of forming process increases. In order to succeed in that, it is necessary to identify, out of a large number of influential factors, the ones which can be influenced throughout the forming process. There are only two such factors: contact pressure on flange and drawbead height [1].

Process control through active complex systems requires constant dynamic feedback between the given function of the objective, controlled and controlling variables [2]. The goal functions and controlled variable can be different: wrinkle height, thinning in critical zone, flange motion, flange thickness change, friction force, forming force, stress in work piece wall etc. The given goal functions are defined either by computer simulations or by previous experiments. Pressure on flange and drawbead height present the controlling effects. High reacting speed to controlled values change and robust controlling hardware and software apparatus are required, which all implies significant investments [2, 3].

There is also the alternative – a much simpler approach – used in this paper. However, first it is necessary to define optimal functions of pressure and drawbead height according to proper criterion (drawing depth, piece quality etc.). This often requires comprehensive experiments [3] in order to identify the character of specified factors influence. With such