ABSTRACTS

Wiesław Barnat, Paweł Dziewulski, Tadeusz Niezgoda
The validations of constitutive models for non metallic foam under complex strain state

In the present article, the results of investigations of energy absorption foam structures weighted down were presented. The main objective of this study was the validations of constitutive models for non metallic foam. Investigations were conducted on Dynamic Testing System INSTRON in KMiIS. The load was applied by input function kinematic.

Tomasz Boguszewski, Krzysztof Molski
Analysis of stresses, COD and energy released rate G for branching cracks

Mutual interactions between two neighboring singular stress fields for branching cracks are analyzed. Using the finite element method and ANSYS program, relative crack opening and range of validity of the singular stress fields have been obtained. Some special functions were chosen for describing crack face opening, including two different singular stress field exponents. Numerical results make it possible to explain the influence and applicability of stress intensity factors for such cracks and show qualitatively additional effects and cracking conditions around the crack tip for plane and anti-plane crack problems.

Tomasz Czapla, Mariola Jureczko, Mariusz Pawlak
Assignment of stress reserve factor for chosen wind turbine elements

Calculations were performed for horizontal axis wind turbine. Stress Reserve Factors were calculated for DLC 6.1 load case according to Germanischer Lloyd. Wind conditions were assumed for I-class wind turbine. As a first step, FEM calculation with using AnSYS software was performed with maximum values of principal stresses as an output. Then, based on FEM analysis results, Stress Reserve Factors were calculated. SRF values show that analyzed torsional support and planet gear have sufficient strength for extreme loads. Methodology of safety margin evaluation presented in this paper allows to assess if the object fulfills relevant standards demanding.

Andrzej Grządziela
Dianosing of combined COGAG type ships power plant

The paper presents a proposal method of diagnosing dynamics of ships combined propulsion system with gas turbine engines LM 2500 type with the use of DGPS and EGNOS systems. Two operational parameters were considered according acceleration, speed and distance of the ship during non-steady state. Methods of collecting and processing of measurement data were characterized, moreover calculated errors were presented as well. The discussion about helpfulness of both systems for positioning of vessel finalized the paper.

Andrzej Kazberuk
Determination of the fracture toughness parameters of the quasi-brittle material using cylindrical specimen

The method of determination of critical SIF of brittle and quasi-brittle material is presented. For the splitting cylindrical specimen with central diamond-shaped hole the stress intensity factors were calculated for arbitral vertex angle. The values of critical SIF was obtained considering the deformation fracture criterion based on Dugdale model of failure with assumption that fracture process zone starts from notch tip.

Roman Kulczycki-Żyhajło, Waldemar Kołodziejczyk, Gabriel Rogowski
Selected issues of theory of elasticity for layered bodies

Selected issues of contact theory of elasticity for pres-sing the rigid punch in non-homogeneous half-space are consi-dered. Half-space consists of homogeneous half-space and a package of n isotropic homogeneous layers. Algorithm of calculation was based on integral transformation and was verified by mode-ling the layered bodies by periodic layers or layers, which the Young's module is changed along the thickness of the layer with the exponential dependence.

Adam Mazurkiewicz
Relations among dexa density, mineral content and strength of human trabecular bone

In the paper, it was presented results of investigation relations between DEXA density, mineral content and strength of human trabecular bone. An agreement of evaluation strength of trabecular bone on the base DEXA density and mineral content of trabecular bone was proved.

Adam Mazurkiewicz, Tomasz Topoliński
Possibilities computational estimiation of Young's module values of trabecular bone

In the paper, there were compared results of calculations of Young's module samples of trabecular bone obtained by two methods. First, there were calculated by used FEM software microCT station. Second, there were executed in Ansys software with used results measurement properties of single trabeculae by ultrasonic method. The values obtained from the method were from 43 to 50% in comparision to values obtained with use FEM software microCT station. Linear relationship between the results from both methods was described by determination coefficients R2>0,87.

Jerzy P. Okrajni
The thermo-mechanical fatigue in standards and computer modelling

The main purpose of this work is the description of the mechanical behaviour of power plant components working under mechanical and thermal loading that cause the thermo-mechanical fatigue fracture in selected areas of the component surfaces. The computer modelling has been used to describe the local stress-strain behaviour of the chosen component. The stress and strain fields have been determined under thermal loading. Tensile thermal stresses of high values are created especially under conditions of sudden cooling during unsteady work of a power unit. The presented analysis is the part of the complex investigation method which main purpose is increasing accuracy of the TMF process description and thermo-mechanical life assessment.

Dariusz M. Perkowski, Roman Kulchytsky-Zhyhaiło, Stanisław J. Matysiak
Contact problem with heat generation for a periodic stratified composite half-space with boundary normal to the lauering

In the paper, the contact problem with heat generation for a non-homogeneous half-space is considered. The body is assumed to be a periodically layered two-constituted, linear-thermoelastic, periodically repeated layers and the boundary is normal to the layering. A rigid punch with parabolic cross-section moving with a constant velocity in the direction of layer-ing generates frictional heat described by Coulumb law. It is assumed that the punch is thermal insulator and the generated heat is transferred to the composite half-space. The boundary beyond the contact zone is assumed to the free of loading and with zero temperature. The problem were solved within the framework of the homogenized model with microlocal parameters, cf. Woźniak (1987), Matysiak and Woźniak (1988).

Georgij Petriaszwili, Yuriy Pyryev
Eksperimental investigations of the pulling out the sheet from the book spine adhesive layer

Currently produced devices to evaluate the durability of books differ in design and testing parameters, which result in different value of the strength of the same books tested at dif-ferent test apparatus. One of the most important parameters affect-ing the measurement result is the opening angle of the book. The research study investigated the influence of the angle of opening book on the Pull Test value of durability of the book spine adhe-sive layer.
The results of experimental studies allow to learn the influence of the angle of opening book for the strength value of the books tested on different testing machines.

Yuriy Pyryev, Georgij Petriaszwili
Mathematical modeling of the process of pulling out the sheet from the book spine adhesive layer

The research study proposed spine adhesive layer model with the paper pages witch represents the actual geometry and material properties of the spine during opening and testing the book by Pull Test method.

Mykhaylo Savruk, Krzysztof Molski, Grzegorz Rogowski
Stress intensity factors K_I for a plane tunnel crack in elastic space

The present paper deals with determination of stress intensity factors K_I for a plane two-dimensional tunnel crack in elastic space when both crack faces are subjected to any normal pressure. Using the method of singular integral equations and numerical techniques Green's function was also obtained, which makes it possible to calculate values of stress intensity factors K_I at any point along both crack fronts. Approximate analytical solutions of high accuracy were found. Numerical values of K_I were compared with other solutions known from the literature, obtained by different authors.

Robert Uścinowicz
Investigations of mechanical properieties of Al-Zn composite using various methods of specimens loading

In the work the analysis of influence the loading type of Al-Zn two-layer metallic composite on its mechanical properties was made. The results of tensile tests of flat composite samples made from the thin aluminium and zinc metallic strips using glue CX-80 were presented. Tests were carried out at the room temperature using two method of specimen loading controlled by signal of strain $-\ \dot{\varepsilon} = 2\cdot10^{-3}\,1/s$ and stress $-\ \dot{\sigma} = 0.6\,MPa/s$.

Components of Al-Zn composite (aluminium and zinc) were tensile tested and Al-Zn* package. It was found, that applying the defined method of loading fundamentally influenced on the shape of tensile characteristics (curves), values of mechanical properties of materials and essentially differentiated values of hardening curves coefficients. The experimental data received these tests were compared with analogous values received from equations based on law of mixtures, which took into consideration the mechanical properties of composite components.

Mirosław Witoś
Fatigue material assesment on the base of magnetic shape memory phenomena

In the abstract there has been presented magnetic memory phenomena (MPM). Theoretical background is delivered with the examples of aerospace elements diagnosis. In the article ad-vantages of technique (MPM) has been presented as well as diffi-culties met during the inspection for example small elements and such as: driving shafts or compressor's blades. Moreover indication of necessity of the reliability prove for the fatigue HCF and VHCF cracks has been highlighted.

Krzysztof P. Wituszyński, Wiktor Jakubowski
Analysis of the zi engines cars exhaust-gas toxicity in the light of valid traffic regulations

Results concerning fulfilment of the ehxust-gas toxicity norms of cars with ZI engines equipped with catalyctic converter and either OBD or EOBD gears are shown in the article. Mea-surements were taken with use of a multicomponent exhaust-gas analyzier type CET 200B and diagnostical information reader OPUS OBD Contoler. Cars were examined in regional vehicle control station