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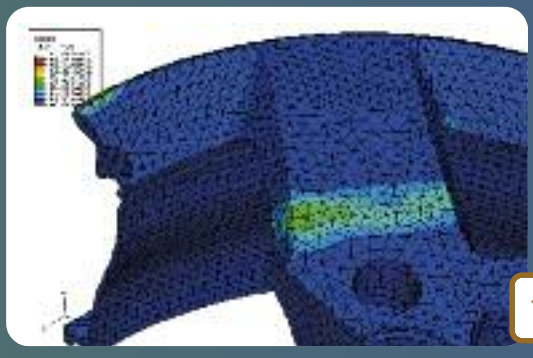
Research papers

Materials

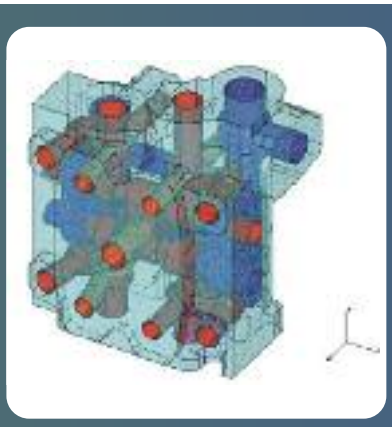
Properties

Analysis and modelling

The paper written by M. Greger, V. Vodárek, L.A. Dobrzański , L. Kander, R. Kocich and B. Kuřetová on "The structure after ECAP and low-cycle fatigue of steel austenitic AISI 316" on a **page 151** discusses some results of investigation of structure and properties of austenitic steel grade AISI 316 after application of Equal Channel Angular Pressing (ECAP) at the temperature of approximately 290°C. It was established with use of the EBSD technique that after 8 passes through the ECAP die the sub-grains with an angle of disorientation smaller than 10° formed less than 20% of resulting structure. The average size of austenitic grains with high angle boundary after 8 passes was approximately 0.32 μm. It was proven that the ECAP method enables obtaining of ultra fine-grained austenitic structure formed by recrystallised grains with very low density of dislocations. The ECAP method led to significant improvement of strength of investigated material. Experiments were planned and realised at the temperature ranging from room temperature up to above mentioned temperature. It can be predicted on the basis of obtained results that contrary to low-cycle fatigue the ultra-fine grained material will manifest at fatigue load in the mode of constant amplitude of stress higher fatigue characteristics, particularly fatigue limit.

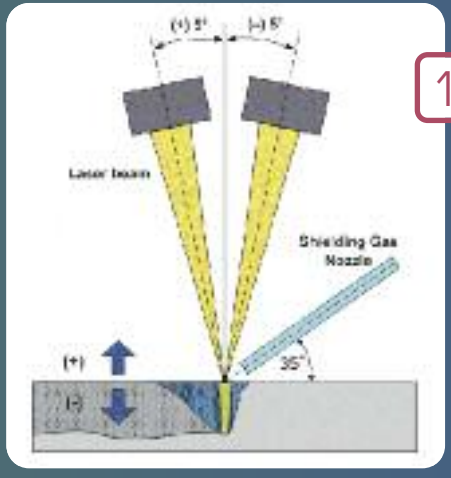


The paper entitled "Finite element simulation of wheel impact test" by C.L. Chang and S.H. Yang on a **page 167** shows that the computer simulation of these tests can significantly reduce the time and cost required to perform a wheel design. In order to achieve better performance and quality, the wheel design and manufacturing use a number of wheel tests (rotating bending test, radial fatigue test, and impact test) to insure that the wheel meets the safety requirements. The test is very time consuming and expensive. The prediction of a wheel failure at impact is based on the condition that fracture will occur if the maximum strain energy density of the wheel during the impact test exceeds the total plastic work of the wheel material from tensile test. The simulated results in this work show that the total plastic work can be effectively employed as a fracture criterion to predict a wheel fracture of forged aluminium wheel during impact test. In this study, the nonlinear dynamic finite element analysis is performed to simulate a forged aluminium wheel during SAE impact test. The structural damage parametre of the wheel is estimated by the strain energy density, and the fracture criterion is based on the total plastic work of the wheel material.



175

The paper from Analysis and modelling area made by Sang woo Lee, Dae young Shin and Cheol woong Byun on "Design of basic chamber of the Main Control Valve" on a **page 175** describes development of a control valve for closed circuit requires comprehensive technologies in the overall precision machinery industry, from the development of casting materials for the housing to various types of parts. The development of a new type of control valve would have great advantage with a long lifecycle. Therefore, it is necessary to secure the MCV (Main Control Valve) development technology that applies various sensors. This paper aims to provide a fundamental base for the establishment of design systems including the flow chamber design database of the MCV for wheel loaders, strength and rigidity design system, and the system for energy efficiency improvement. Particularly, this study set up the basic design database for the flow chamber design to establish the flow chamber design database, and secured the stability of the flow chamber from the basic design stage. In addition, major design variables were determined by utilizing a statistical technique in order to design such flow chamber. The basic data needed to design the MCV can be provided, and the required time for the design and the reliability of the design can be reduced and improved respectively. This study establishes the unit flow chamber database for the MCV housing unit and the governing equation for the flow chamber.



187

The paper written by J.-K. Kim, H.-S. Lim, J.-H. Cho and C.-H. Kim on "Bead-on-plate weldability of Al 5052 alloy using a disk laser" on a **page 187** presents the effect of the laser welding parametres of the laser focal position and beam angle on the weldability of an Al 5052 thick plate using a 4kW disk laser. It is applicable as a ground technique for the laser welding of aluminium alloy to increase the productivity and quality using the recently developed disk laser. Although the penetration depth decreased as the focal point moves away from the surface, the appearance of the bead improved and the porosity decreased. The weldability according to the inclination angle of the laser beam was also investigated. It was found that a forward inclination of the laser beam (when the inclination angle is an acute angle) could enhance the weldability compared with a backward inclination. The outcome of the research shows the influence of the welding parametres on weldability aspects in disk laser welding of an Al alloy.

Manufacturing and processing

Industrial management and organisation

Indexes