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POJAV REZONANCE V PROSTO VRTEČIH SE KROŽNIH ŽAGNIH LISTIH

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Izvleček

V članku je prikazana analiza aerodinamičnega vzburjanja prosto vrtečega se krožnega žagnega lista. Ko se krožni žagni list prosto vrti, se zrak v pazdušnem prostoru ozobljenega dela orodja pri prehodu rezila loči od njegovih mejnih bočnih površin in tvori spremenljivo valovito brazdo oziroma turbulentni tok zraka. Posledica časovno spremenljivega turbulentnega toka je nastanek spremenljivega tlaka zraka ob površinah rezila, kar predstavlja aerodinamično vzburjanje žagnega lista. Za pojav prečnega resonančnega nihanja orodja ne zadošča zgolj aerodinamično generirana vzbujevalna sila s primerno frekvenco. Poleg omenjenega pogoja morata biti namreč izpolnjena še dodatna pogoja, in sicer morajo biti vzbujevalne tlačne razlike okoliškega zraka primerno velike, dušilne sposobnosti materiala nosilnega telesa žagnega lista pa dovolj majhne. Ugotovili smo, da nikoli nista vzburjena dva ali več lastnih načinov nihanja hkrati in da je prehod iz enega resonančnega stanja v drugega skokovit. Z naraščajočo frekvenco vrtenja se praviloma povečuje tudi območje vrtljajev, v katerem pride do aerodinamične vzbuditve lastnih nihajnih načinov.

Ključne besede: resonanca, aerodinamično vzburjanje, nihanje krožnih žagnih listov, hrup prosto vrtečih se krožnih žagnih listov, stabilnost krožnih žagnih listov

RESONANCE IN IDLING CIRCULAR SAW BLADES

Abstract

The article deals with the analysis of the aerodynamic excitation of a freely rotating circular saw blade. When the circular saw blade rotates freely, the air in the gullet spaces of the rim area of the tool separates (in the passing of the knife from its border flanking surfaces) and forms a variable waveform wake or turbulent airflow. The consequence of the time-variable turbulent airflow is the occurrence of variable air pressure along the knife surfaces, which constitutes the aerodynamic excitation of the saw blade. For the occurrence of transversal resonant vibration of the tool, there does not suffice only aerodynamically generated excitation force at a suitable frequency. In addition to the said condition, two additional conditions must also be met: the exciting pressure differences of the surrounding air must be adequately large, and the damping capabilities of the material of the saw plate sufficiently small. We have found that two or more natural manners of vibration are never excited simultaneously and that the transition from one resonant condition into another is abrupt. With the increasing frequency of rotation there is also, as a rule, an increase in the range of rotations in which the aerodynamic excitation of natural manners of vibration occurs.

Key words: resonance, aerodynamic excitation, circular saw blade vibrations, circular saw blade idling noise, circular saw blade stability

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