

Genetic programming method for modelling of cup height in deep drawing process

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ABSTRACT

Genetic programming method for modelling of maximum height of deep drawn high strength sheet materials is proposed in this paper. Genetic programming (GP) is an evolutionary computation approach which uses the principles of Darwin's natural selection to develop effective solutions for different problems. The aim of the research was the modelling of cylindrical cup height in deep drawing process and analysis of the impact of process parameters on material formability. High strength steel sheet materials (DP1180HD and DP780) were formed by deep drawing using different punch speeds and blank holder forces. The heights of specimens before cracks occur were measured. Therefore, four input parameters (yield stress, tensile strength, blank holder force, punch speed) and one output parameter (cup height) were used in the research. The experimental data were the basis for obtaining various accurate prediction models for the cup heights by the genetic programming method. Results showed that proposed genetic modelling method can successfully predict fracture problems in a process of deep drawing.

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Modeliranje višine skodelice pri globokem vleku z metodo genetskega programiranja

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POVZETEK

V prispevku je predlagana metoda genetskega programiranja za modeliranje maksimalne višine globoko vlečenih materialov visoke trdnosti. Genetsko programiranje (GP) je evolucijski računski postopek, ki uporablja načela darvinistične naravne selekcije za razvoj učinkovitih rešitev za različne probleme. Cilj raziskave je bil modeliranje višine cilindrične skodelice z globokim vlekom in analiza vpliva procesnih parametrov na sposobnost materiala za preoblikovanje. Z globokim vlekom smo preoblikovali dve vrsti jeklene pločevine z visoko trdnostjo (DP1180HD in DP780) z uporabo različnih hitrosti preoblikovanja in vpenjalnih sil vpenjalne naprave. Izmerili smo višine vzorcev pred pojavom razpok. V raziskavi so bili uporabljeni štirje vhodni parametri (napetost tečenja, natezna trdnost, vpenjalna sila, udarna hitrost) in en izhodni parameter (višina skodelice). Eksperimentalni podatki so bili osnova za pridobitev različno uspešnih napovedovalnih modelov za višino skodelic z metodo genskega programiranja. Rezultati so pokazali, da predlagana metoda genetskega programiranja uspešno napoveduje težave povezane z lomom pri postopku globokega vleka.

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PODATKI O ČLANKU

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