

## Multi-criteria selection of manufacturing processes in the conceptual process planning

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### ABSTRACT

Process planning is one of the most difficult tasks in product development caused by the large number of technical, technological, economic, environmental and other criteria. Accordingly, the selection of manufacturing processes is a complex multi-criteria decision making problem since it considers a number of possible alternative manufacturing processes in addition to a large number of specified criteria. This paper represents the computer-aided methodology for the multi-criteria evaluation and selection of manufacturing processes at the stage of conceptual process planning. The developed methodology is primarily focused on the mapping of product design and manufacturing requirements. Manufacturing processes that fail to meet the given conditions on the basis of 10 criteria such as materials, production volume, productivity, dimensional accuracy, surface finish, etc., are eliminated according to the developed rules. Then, the multi-criteria evaluation and ranking of manufacturing processes is performed based on 5 criteria: manufacturing cycle time, process flexibility, material utilization, quality and operating costs. Based on this methodology, a system is developed for the multi-criteria selection of manufacturing processes, whose implementation is presented in the case of the hip joint endoprosthesis.

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## Večkriterijska izbira izdelovalnega postopka v fazi konceptualnega planiranja

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### POVZETEK

Zaradi velikega števila tehničnih, tehnoloških, ekonomskih in okoljskih kriterijev je planiranje izdelovalnega postopka v fazi razvoja izdelka ena izmed težjih nalog. Izbor izdelovalnega postopka je kompleksen večkriterijski optimizacijski problem, ki mora upoštevati možne alternativne izdelovalne postopke in hkrati izpolniti številne zahteve izdelka. Članek predstavlja računalniško podprto metodologijo za večkriterijsko vrednotenje in izbor izdelovalnega postopka že v fazi konceptualnega planiranja izdelave. Razvita metodologija temelji na povezovanju oblike izdelka z izdelovalnimi zahtevami. Izločijo se izdelovalni postopki, ki ne izpolnjujejo desetih kriterijev, kot so material, obseg proizvodnje, produktivnost, dimenzijska natančnost, površinska obdelava itd. Nato se pripravi ocena in razvrstitev alternativ na osnovi petih kriterijev: časa izdelovalnega cikla, prilagodljivosti izdelovalnega postopka, izkoriščenosti materiala, kakovosti in stroškov izdelave. Pripravljen sistem za večkriterijsko izbiro izdelovalnega postopka je bil preizkušen na primeru izdelave endoproteze.

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### PODATKI O ČLANKU

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