

Infrared temperature measurement and increasing infrared measurement accuracy in the context of machining process

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ABSTRACT

One of the major challenges in the machining process is measuring the temperature accurately which has a considerable importance in calibrating finite element models and investigating thermodynamic of machining process. In the present paper, one of the effective methods for measuring temperature in the machining processes – i.e. infrared imaging – is used and effective parameters which increase measurement accuracy are investigated. One of the most effective parameter in the temperature measurement accuracy of infrared imaging is extracting and calibrating the emissivity coefficient for different temperature ranges. The obtained results show that the lack of precision calibration of the emissivity for different temperature ranges may cause high error in the measurement results. To measure temperature, several experiments are performed for turning a thin walled workpiece which is made of aluminium alloy Al-7075 and the effects of the machining parameters and tool material – polycrystalline diamond (PCD) and cemented carbide – are studied. Based on the achieved results, it can be concluded that the generated temperature in the cutting area can be decreased significantly by using PCD tools and selecting appropriate machining parameters.

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Infrardeče merjenje temperature in povečanje natančnosti infrardečega merjenja v kontekstu obdelovalnega postopka

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POVZETEK

Pri obdelovalnih postopkih je eden glavnih izzivov natančno merjenje temperature. To ima velik pomen pri umerjanju modelov končnih elementov in proučevanju termodinamike obdelovalnega procesa. V prispevku je uporabljena ena izmed učinkovitih metod za merjenje temperature pri obdelovalnih postopkih, infrardeče snemanje, preučeni pa so parametri, ki učinkovito povečujejo natančnost merjenja. Eden izmed najučinkovitejših parametrov pri merjenju temperature z ustvarjanjem infrardeče slike je ekstrakcija in umerjanje emisijskega koeficienta za različne temperature. Dobljeni rezultati kažejo, da lahko pomanjkanje natančnega umerjanja emisije za različna temperaturna področja povzroči veliko napako pri rezultatih merjenja. Merjenje temperature je izvedeno v več poskusih struženja tankostenskega obdelovanca iz aluminijeve zlitine Al-7075. Proučeni so učinki obdelovalnih parametrov in orodnega materiala – polikristalnega diamanta (PCD) in karbidne trdnine. Na podlagi dobljenih rezultatov sklepamo, da se z uporabo PCD orodij in primerne izbranimi obdelovalnimi parametri močno zniža temperatura v območju rezanja.

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PODATKI O ČLANKU

Ključne besede:

Obdelava

IR meritve temperature

Emisije

Orodja iz PCD

Orodja iz karbidne trdnine

Al-7075

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