

ABSTRAK

Proses pemotongan *spur gear* menuntut ketelitian dimensi dan kualitas permukaan yang tinggi, terutama pada material stainless steel 304. Penelitian ini bertujuan untuk menganalisis pengaruh variasi *pulse on time* dan *feed rate* terhadap *kerf width* dan *microtopography* pada proses pemotongan *spur gear* menggunakan Wire Electrical Discharge Machining (Wire EDM). Metode yang digunakan adalah eksperimen dengan desain faktorial dua faktor, dengan variasi *pulse on time* sebesar 50 μ s, 75 μ s, dan 100 μ s serta *feed rate* sebesar 70 mm/min, 75 mm/min, dan 80 mm/min. *Kerf width* diukur pada area dedendum, addendum, dan diameter luar menggunakan *Video Measuring Machine*, sedangkan *microtopography* dianalisis menggunakan *Scanning Electron Microscope* (SEM). Data dianalisis menggunakan metode *Analysis of variance* (ANOVA). Hasil penelitian menunjukkan bahwa *pulse on time* berpengaruh signifikan terhadap *kerf width* dengan nilai *p-value* 0,044 dan kontribusi sebesar 23,24%, sedangkan *feed rate* tidak berpengaruh signifikan dengan *p-value* 0,088 dan kontribusi 17,36%. Interaksi kedua parameter juga tidak berpengaruh signifikan terhadap *kerf width* (*p-value* 0,887). Hasil pengamatan *microtopography* menunjukkan bahwa kombinasi *pulse on time* 100 μ s dan *feed rate* 70 mm/min menghasilkan kualitas permukaan terbaik dengan nilai rata-rata area 0,0161, sedangkan kualitas permukaan terendah terjadi pada kombinasi *pulse on time* 50 μ s dan *feed rate* 70 mm/min dengan nilai rata-rata area 0,0458. Pemilihan kombinasi parameter yang tepat terbukti mampu menghasilkan *kerf width* yang lebih terkendali dan kualitas *microtopography* yang optimal.

Kata kunci: *pulse on time* , *feed rate*, *kerf width*, *microtopography*, *spur gear*, wire EDM, stainless steel 304.

ABSTRACT

The machining of spur gears requires high dimensional accuracy and surface quality, particularly when using materials such as stainless steel 304 that are difficult to machine by conventional methods. This study aims to analyze the effects of pulse on time and feed rate variations on kerf width and microtopography in the spur gear cutting process using Wire Electrical Discharge Machining (Wire EDM). An experimental method with a two-factor factorial design was employed, with pulse on time levels of 50 μ s, 75 μ s, and 100 μ s and feed rate levels of 70 mm/min, 75 mm/min, and 80 mm/min. Kerf width was measured at the dedendum, addendum, and outer diameter using a Video Measuring Machine, while microtopography was analyzed using a Scanning Electron Microscope (SEM). The experimental data were statistically analyzed using Analysis of variance (ANOVA). The results show that pulse on time has a significant effect on kerf width with a p-value of 0.044 and a contribution of 23.24%, whereas feed rate does not have a significant effect with a p-value of 0.088 and a contribution of 17.36%. The interaction between pulse on time and feed rate also shows no significant effect on kerf width (p-value = 0.887). Microtopography observations indicate that the combination of pulse on time 100 μ s and feed rate 70 mm/min produces the best surface quality with the smallest average area value of 0.0161, while the poorest surface quality occurs at pulse on time 50 μ s and feed rate 70 mm/min with an average area value of 0.0458. Overall, selecting an appropriate combination of pulse on time and feed rate is proven to produce more controlled kerf width and optimal microtopography quality in the spur gear cutting process using Wire EDM.

Keywords: *pulse on time , feed rate, kerf width, microtopography, spur gear, Wire EDM, stainless steel 304.*