INTISARI

Penelitian ini bertujuan untuk mengetahui pengaruh variasi arus EDM terhadap *Material Removal Rate* (MRR) dan karakteristik permukaan bagian atas dan samping *strut stent* jantung, dan mengetahui pengaruh variasi waktu proses *electropolishing* terhadap karateristik permukaan bagian atas dan samping *strut stent* jantung. Karateristik permukaan hasil proses EDM yang dianalisis adalah kekasaran permukaan, ketebalan *recast laye*r, diameter *crater,* dan pada proses *electropolishing* adalah kekasaran permukaan, perubahan berat, dan reduksi lebar *strut stent* jantung. *Recast layer*, *crater* dan reduksi lebar *strut* dianalisis menggunakan mikroskop optik dan diukur menggunakan *software image* J, kekasaran permukaan diukur menggunakan *stylus profilemeter,* perubahan berat *stent* ditimbang menggunakan timbangan digital. Arus (I) yang digunakan pada proses EDM adalah 1.5 A / 45µs, 3.0 A / 90 µs, 4.5 A / 120 µs, dan 6 A / 150 µs, nilai *pulse on time* merupakan nilai yang disedikan mesin EDM pada masing masing arus (I), dan waktu yang divariasikan pada proses *electropolishing* adalah 3 menit, 7 menit, dan 11 menit.

Hasil penelitian menunjukan bahwa arus (I) EDM berpengaruh terhadap nilai MRR, *recast layer*, kekasaran permukaan, dan diameter *crater*. Hasil pengukuran menunjukan semakin besar arus (I) maka nilai MRR, ketebalan *recast layer*, kekasaran permukaan, dan diameter *crater* akan semakin besar, selain dipengaruhi oleh arus, nilai MRR, ketebalan *recast layer*, kekasaran permukaan, dan diameter *crater* dipengaruhi oleh *pulse on time* (Ton). Interval ketebalan rata rata *recast layer* adalah 17- 97 µm, kekasaran permukaan pinggir *strut* adalah 3,49 – 9,53 µm, diameter *crater* adalah 75 – 276 µm, dan kekasaran permukaan bagian atas *strut* adalah 0,5 µm yang dihasilkan dari proses *mechanical polishing*. Kualitas permukaan *strut* yang optimal dihasilkan pada arus EDM 1.5 A / 45 µs. *Stent* jantung berhasil diproduksi dengan arus 1,5 A / 45 µs pada material AISI 316 L dan 3,0 A / 90 µs pada material CP TI 2. *Stent* memiliki ketebalan 0,25 mm, diameter luar 3,5 mm dan panjang 20 mm pada material AISI 316 L dan 10 mm pada material CP Ti 2. Hasil proses *electropolihsing* pada temperatur kamar dan voltase 5 V menghasilkan *stent* jantung dengan permukaan yang halus dan mengkilat pada waktu proses 7 menit. Waktu proses *elecctropolishing* berpengaruh terhadap kekasaran permukaan atas dan samping *strut,* kehilangan berat, dan reduksi lebar *strut*. Hasil analisis menunjukkan bahwa semakin lama waktu proses *electropolishing* maka kekasaran permukaan *strut* bagian atas dan samping, berat *stent,* dan lebar *strut* akan semakin kecil. Interval kekasaran permukaan pinggir *strut* adalah 3,49 – 1,62 µm, kekasaran permukaan atas *strut* adalah 0,54-0,222 µm, pengurangan berat adalah 0,12 - 1,12 %, dan reduksi lebar *strut* adalah 11,02 – 69,3 %.

Kata kunci : EDM, *Stent* jantung, *Electropolishing*, AISI 316 L, CP Ti 2

ABSTRACT

This study investigated the effect of pulsed currents on the Matrial Removal Rate (MRR) and the surface characteristics both are EDMed surface and upper surface of the strut cardiovascular stent, and the effect of time of electropolishing on the surface characteristics both are EDMed surface and upper surface of the strut cardiovascular stent. In EDM, The surface characteristics of the strut observed were recast layer, surface roughness, and the size of crater's diameter, and in electropolishing, the surface characteristics of the strut observed were recast layer, surface roughness, weight analysis, and reduction of width strut. The recast layer, the size of crater's diameter, and strut width reduction were analyzed by optical microscope and measured by image J software, the surface roughness was measured by stylus profilometer, the weight analysis was measured by digital analytical balance. The pulse currents which were used in manufacturing of stent by die singking EDM were 1.5 A / 45µs, 3.0 A / 90 µs, 4.5 A / 120 µs, and 6 A / 150 µs, the values of pulse on time (Ton) were provided by the EDM machine for every pulse current with zero percent electrode wear rate parameter, and the time which were used in the electropolishing were 3 minutes, 7 minutes, and 11 minutes.

The experimental results show that the pulse currents affect the MRR, recast layer, surface roughness, and the size of crater's diameter. The results show that increasing of pulse current, the value of MRR, the thickness of recast layer, surface roughness, and crater's diameter will increase, besides being influenced by the pulse current, the value of MRR, the thickness of recast layer, surface roughness, and crater's diameter influenced by the pulse on time (Ton). The average thickness of recast layer is in the range of 17- 97 µm, the EDMed surface roughness is in the range of 3,49 – 9,53 µm, and the size of crater's diameter is in the range of 75 – 276 µm, the upper surface roughness of the strut is 0,5 µm which generated from mechanical polishing. The best quality of the strut generated from the pulse current 1.5 A / 45 µs which has a thin recast layer, low value of surface roughness and the size of crater's diameter. The stent is successfully manufactured from minitube AISI 316 L by pulse current 1,5 A / 45 µs and CP TI 2 by pulse current 3,0 A / 90 µs. The outer diameter 4 mm, 0.3 mm thickness, and length 20 mm for AISI 316 L and lenghth 10 mm for CP Ti 2. The experimental results show that the optimal time for smoothing and brightening of stent at room temperatur and low voltage 5 V is 7 minutes, the times affect the side and upper surface roughness, the weight of stent and the width of strut. The results show that increasing of times, than the value of surface roughness, the weight of stent and the width of strut will decrease, and vice verse. The average surface roughness of side surface after electropolishing is in the range of 3,49 – 1,62 µm, the average surface roughness of upper surface after electropolishing is in the range of 0,54 - 0,22 µm , the reduction of weight analysis is in the range of 0,12 - 1,12 %, and the reducction of width strut is in the range of 11,02 – 69,3 %.

Keyword : EDM, Cardiovascular stent, Electropolishing, AISI 316 L, CP Ti 2