

## ABSTRAK

### PENGARUH PANJANG *NOZZLE* TERHADAP KUALITAS FILAMEN HASIL DAUR ULANG BOTOL PET DENGAN METODE PULTRUSI

Muhammad Elman Daraini

(2025: xiv + 65 Halaman, 54 Gambar, 14 Tabel, 4 Lampiran)

Limbah botol plastik berbahan *polyethylene terephthalate* (PET) terus meningkat dan sulit terurai secara alami, sehingga diperlukan upaya pengolahan yang berkelanjutan. Salah satu alternatifnya adalah mendaur ulang PET menjadi filamen untuk 3D *printing* melalui metode pultrusi. Namun, filamen yang dihasilkan sering mengalami porositas. Penelitian ini bertujuan untuk menyelidiki pengaruh panjang *nozzle* dan lebar pita plastik terhadap kualitas filamen PET hasil pultrusi. Kualitas filamen diuji melalui pengukuran diameter, observasi visual, dan uji cetak 3D. Hasil penelitian menunjukkan bahwa variasi panjang *nozzle* tidak berpengaruh signifikan terhadap kualitas filamen, meskipun terdapat tren penurunan porositas seiring bertambahnya panjang *nozzle*. Sebaliknya, lebar pita plastik berpengaruh signifikan terhadap porositas, dengan lebar 12 mm menghasilkan porositas terendah. Uji cetak 3D objek kubus menunjukkan seluruh dimensi berada dalam toleransi  $\pm 0,2$  mm, dan permukaan cetakan semakin halus seiring bertambahnya lebar pita. Temuan ini mengindikasikan bahwa optimasi lebar pita plastik lebih krusial dibanding panjang *nozzle* dalam meningkatkan kualitas filamen PET hasil pultrusi.

**Kata Kunci:** daur ulang PET, filamen 3D, *nozzle*, metode pultrusi

## ABSTRACT

### THE EFFECT OF NOZZLE LENGTH ON THE QUALITY OF FILAMENT FROM RECYCLED PET BOTTLES USING THE PULTRUSION METHOD

**Muhammad Elman Daraini**

**(2025: xiv + 65 pp., 54 Figures, 14 Tables, 4 Attachments)**

The accumulation of polyethylene terephthalate (PET) bottle waste continues to increase and poses environmental challenges due to its resistance to natural degradation. Recycling PET into 3D printing filament through the pultrusion method offers a more sustainable alternative. However, the produced filament often exhibits porosity. This study aims to investigate the effect of nozzle length and plastic strip width on the quality of pultruded PET filament. The filament quality was evaluated through diameter measurement, visual observation, and 3D printing tests. The results indicate that nozzle length variation has no significant effect on filament quality, although a decreasing trend in porosity was observed with longer nozzles. In contrast, the plastic strip width significantly affected porosity, with a width of 12 mm producing the lowest porosity. The 3D printing test of a cube showed that all dimensions were within a tolerance of  $\pm 0.2$  mm, and surface smoothness improved with wider strips. These findings suggest that optimizing the plastic strip width is more critical than adjusting the nozzle length in improving the quality of pultruded PET filament.

**Keywords :** *recycled PET plastic, filament 3D, nozzle, pultrusion method*