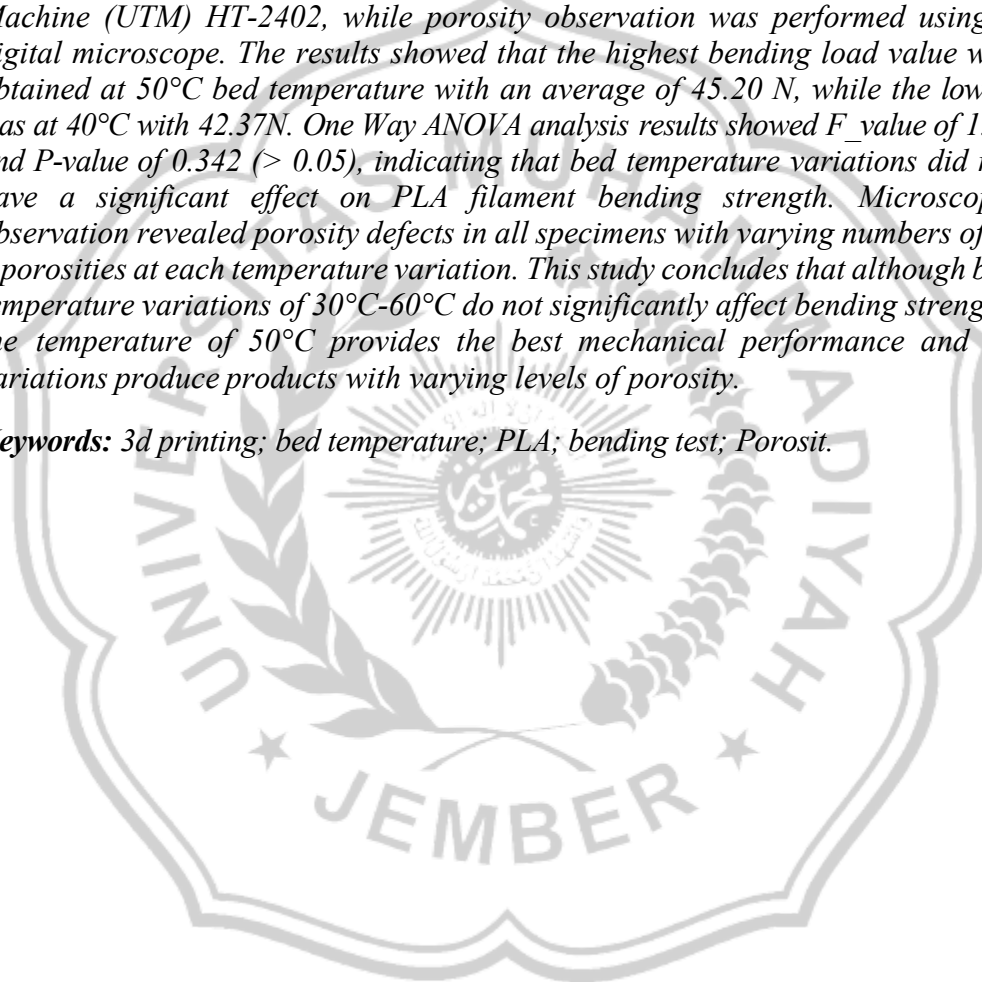


Abstract: 3d printing technology with Fused Deposition Modeling (FDM) method is increasingly developing in various industrial sectors due to design flexibility and material efficiency. This study aims to analyze the effect of bed temperature variations on product visual quality, bending strength, and porosity defects in 3D printed products made from Polylactic Acid (PLA) filament. Bending test specimens were fabricated according to ASTM D790 standard with bed temperature variations of 30°C, 40°C, 50°C, and 60°C, while other parameters were kept constant. Bending testing was conducted using Universal Testing Machine (UTM) HT-2402, while porosity observation was performed using a digital microscope. The results showed that the highest bending load value was obtained at 50°C bed temperature with an average of 45.20 N, while the lowest was at 40°C with 42.37N. One Way ANOVA analysis results showed F_{value} of 1.29 and $P\text{-value}$ of 0.342 (> 0.05), indicating that bed temperature variations did not have a significant effect on PLA filament bending strength. Microscopic observation revealed porosity defects in all specimens with varying numbers of 1-4 porosities at each temperature variation. This study concludes that although bed temperature variations of 30°C-60°C do not significantly affect bending strength, the temperature of 50°C provides the best mechanical performance and all variations produce products with varying levels of porosity.

Keywords: 3d printing; bed temperature; PLA; bending test; Porosit.



Abstrak: Teknologi *3d printing* dengan metode *Fused Deposition Modeling* (FDM) semakin berkembang dalam berbagai sektor industri karena fleksibilitas desain dan efisiensi materialnya. Penelitian ini bertujuan untuk menganalisis pengaruh variasi *bed temperature* terhadap visual produk, kekuatan bending, dan cacat porositas pada hasil cetakan *3d printing* berbahan filament *Polylactic Acid* (PLA). Spesimen uji bending dibuat mengacu pada standar ASTM D790 dengan variasi *bed temperature* 30°C, 40°C, 50°C, dan 60°C, serta parameter lainnya dibuat konstan. Pengujian bending dilakukan menggunakan *Universal Testing Machine* (UTM) HT-2402, sedangkan pengamatan porositas dilakukan menggunakan digital microscope. Hasil penelitian menunjukkan nilai load bending tertinggi diperoleh pada *bed temperature* 50°C dengan rata-rata 45,20 N, sedangkan nilai terendah pada *bed temperature* 40°C sebesar 42,37 N. Hasil analisis *One Way ANOVA* menunjukkan nilai F_{hitung} sebesar 1,29 dan $P\text{-value}$ 0,342 ($> 0,05$), yang mengindikasikan bahwa variasi *bed temperature* tidak memberikan pengaruh signifikan terhadap kekuatan bending filament PLA. Pengamatan mikroskopis menunjukkan adanya cacat porositas pada seluruh spesimen dengan jumlah bervariasi antara 1-4 porositas pada setiap variasi suhu. Penelitian ini menyimpulkan bahwa meskipun variasi *bed temperature* 30°C-60°C tidak berpengaruh signifikan terhadap kekuatan bending, suhu 50°C memberikan performa mekanik terbaik dan seluruh variasi menghasilkan produk dengan tingkat porositas yang bervariasi.

Kata kunci: *3d printing*; *Bed temperature*; PLA; Uji Bending; Porositas.