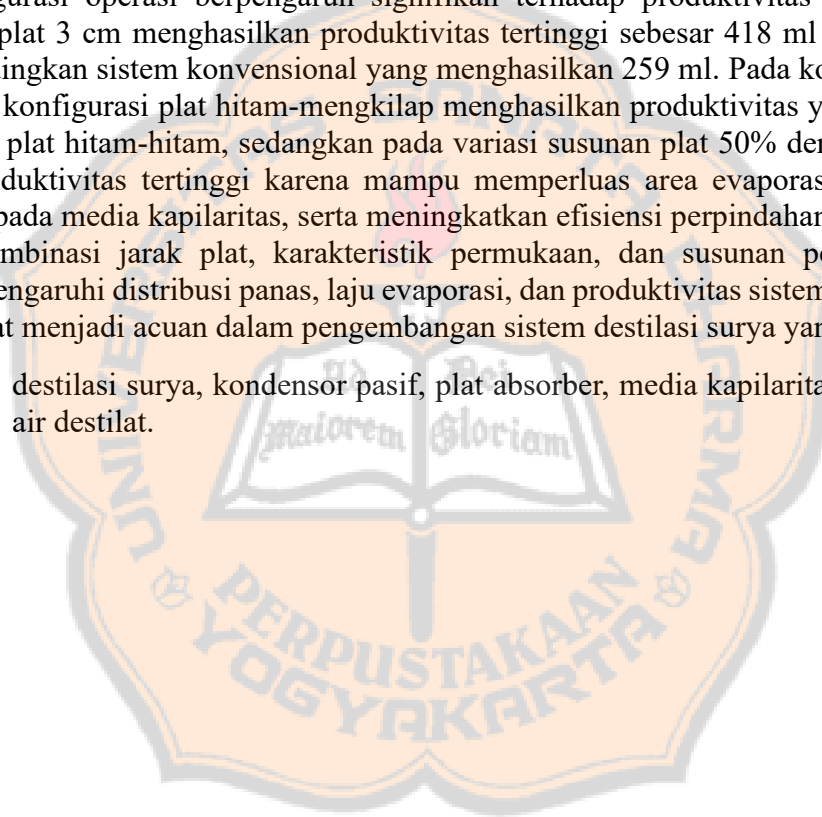


ABSTRAK

Kinerja sistem destilasi surya konvensional masih relatif rendah karena proses perpindahan panas dan massa belum berlangsung secara optimal. Oleh karena itu, penelitian ini dilakukan untuk menganalisis pengaruh variasi jarak ketinggian plat, karakteristik warna permukaan plat, dan susunan pemasangan plat terhadap produktivitas sistem destilasi surya dengan kondensor pasif menggunakan plat absorber lebar 5 cm. Penelitian dilakukan secara eksperimental dengan memvariasikan jarak plat terhadap permukaan air sebesar 3 cm, 4 cm, dan 5 cm, variasi warna permukaan plat berupa hitam-hitam dan hitam-mengkilap, serta variasi susunan plat sebesar 0%, 50%, dan 100%. Setiap pengujian menggunakan volume air awal 2 liter dengan intensitas radiasi buatan sebesar 680 W/m^2 . Parameter yang diukur meliputi temperatur air, temperatur plat, temperatur kaca, dan volume air destilat yang dihasilkan. Hasil penelitian menunjukkan bahwa konfigurasi operasi berpengaruh signifikan terhadap produktivitas destilasi surya. Variasi jarak plat 3 cm menghasilkan produktivitas tertinggi sebesar 418 ml atau meningkat 61,4% dibandingkan sistem konvensional yang menghasilkan 259 ml. Pada kondisi tanpa plat pelapis (0%), konfigurasi plat hitam-mengkilap menghasilkan produktivitas yang lebih tinggi dibandingkan plat hitam-hitam, sedangkan pada variasi susunan plat 50% dengan jarak 3 cm diperoleh produktivitas tertinggi karena mampu memperluas area evaporasi, memperbaiki distribusi air pada media kapilaritas, serta meningkatkan efisiensi perpindahan panas. Dengan demikian, kombinasi jarak plat, karakteristik permukaan, dan susunan pemasangan plat terbukti memengaruhi distribusi panas, laju evaporasi, dan produktivitas sistem destilasi surya, sehingga dapat menjadi acuan dalam pengembangan sistem destilasi surya yang lebih efisien.

Kata kunci: destilasi surya, kondensor pasif, plat absorber, media kapilaritas, produktivitas air destilat.



ABSTRACT

The performance of conventional solar distillation systems remains relatively low due to the suboptimal heat and mass transfer processes. Therefore, this study was conducted to analyze the effects of absorber plate height variation, surface color characteristics, and plate arrangement configuration on the productivity of a solar distillation system equipped with a passive condenser using a 5 cm wide absorber plate. The study employed an experimental method by varying the distance between the absorber plate and the water surface to 3 cm, 4 cm, and 5 cm, using two surface color configurations (black-black and black-shiny), and applying three plate arrangement configurations (0%, 50%, and 100%). Each experiment was conducted using an initial water volume of 2 liters under an artificial solar radiation intensity of 680 W/m². The measured parameters included water temperature, absorber plate temperature, glass cover temperature, and the volume of distilled water produced. The results showed that the operational configuration significantly affected the productivity of the solar distillation system. The 3 cm plate height produced the highest distilled water yield of 418 mL, representing a 61.4% increase compared to the conventional system, which produced 259 mL. Under the 0% plate arrangement configuration, the black-shiny absorber plate consistently produced a higher water yield than the black-black configuration. Meanwhile, the 50% plate arrangement at a 3 cm plate height achieved the highest overall productivity by increasing the evaporation area, improving water distribution through the capillary medium, and enhancing heat transfer efficiency. In conclusion, the combination of plate height, surface characteristics, and plate arrangement significantly influences heat distribution, evaporation rate, and the productivity of the solar distillation system, providing valuable insights for the development of more efficient solar distillation systems.

Keywords: solar distillation, passive condenser, absorber plate, capillary medium, distilled water productivity.