ABSTRAK

Krisis air bersih merupakan masalah global yang melanda berbagai daerah di Indonesia, terutama wilayah pesisir dan pedesaan. Penelitian ini bertujuan untuk menganalisis unjuk kerja distilasi air energi surya menggunakan pasir besi sebagai material penyerap panas (absorber) alternatif untuk meningkatkan produksi air bersih. Eksperimen dilakukan dengan memvariasi tiga parameter: (1) jumlah pasir besi (0, 250, 1000 gram), (2) volume air (100, 150, 250 mL), dan (3) daya pemanas (kecil, sedang, besar) yang disimulasikan menggunakan lampu sebagai pengganti radiasi matahari langsung. Hasil penelitian menunjukkan bahwa penambahan pasir besi sebanyak 250 gram meningkatkan hasil air distilasi sebesar 15,94% dibandingkan sistem konvensional tanpa pasir besi. Namun, peningkatan jumlah pasir besi menjadi 1000 gram justru menurunkan hasil sebesar 5,77% akibat terhambatnya proses penguapan. Pada variasi volume air, volume terkecil (100 mL) menghasilkan air distilasi tertinggi (23,05 mL), tetapi peningkatan hasil relatif lebih rendah (10%) dibanding volume 250 mL (15,94%). Sementara itu, daya pemanas kecil memberikan peningkatan hasil tertinggi secara persentase (64,95%) karena proses pemanasan yang lebih stabil. Kombinasi optimal untuk produksi air distilasi adalah penggunaan pasir besi 250 gram, volume air 250 mL, dan daya pemanas kecil atau sedang. Penelitian ini membuktikan potensi pasir besi sebagai material penyerap panas yang efektif dalam teknologi distilasi berkelanjutan, meskipun kapasitas panas total (Cp total) sistem yang tinggi menjadi faktor pembatas utama.

Kata kunci : distilasi, absorber berpasir, pasir besi

ABSTRACT

Clean water crisis is a global problem that has hit various regions in Indonesia, especially coastal and rural areas. This study aims to analyze the performance of solar energy water distillation using iron sand as an alternative heat absorber material to increase clean water production. The experiment was conducted by varying three parameters: (1) the amount of iron sand (0, 250, 1000 grams), (2) water volume (100, 150, 250 mL), and (3) heating power (small, medium, large) which were simulated using infrared lamps as a substitute for direct solar radiation. The results showed that the addition of 250 grams of iron sand increased the yield of distilled water by 15.94% compared to the conventional system without iron sand. However, increasing the amount of iron sand to 1000 grams actually reduced the yield by 5.77% due to the inhibition of the evaporation process. In the variation of water volume, the smallest volume (100 mL) produced the highest distilled water (23.05 mL), but the yield increase was relatively lower (10%) compared to the volume of 250 mL (15.94%). Meanwhile, small heating power provided the highest yield increase in percentage (64.95%) due to a more stable heating process. The optimal combination for distilled water production was the use of 250 grams of iron sand, 250 mL of water volume, and small or medium heating power. This study proves the potential of iron sand as an effective heat absorbing material in continuous distillation technology, although the high total heat capacity (Cp total) of the system is the main limiting factor.

Keywords: distillation, sandy absorber, iron sand