ABSTRACT

Workshop activities at Balai Yasa Yogyakarta PT. Kereta Api Indonesia routinely produce wastewater that contained pollutants such as metal, Total Suspended Solid (TSS), and Ammonia and complicated to treat if using only standard treatment. Therefore, special treatment is needed to treat wastewater contaminated by these pollutants using floating treatment wetland method with vetiver (Vetiveria zizanioides) and bacteria. The purpose of this research is to evaluate the ability of vetiver (Vetiveria zizanioides) and bacteria in reducing metal content of Iron (Fe), Lead (Pb), and Copper (Cu), Total Suspended Solid (TSS), and Ammonia of wastewater in Balai Yasa Yogyakarta using floating treatment wetland method. Wastewater is filled into the container boxes and extracted bacteria from contaminated soil in Balai Yasa Yogyakarta is added to several container boxes. Furthermore, flat-shaped styrofoam is perforated with 5 holes and then each hole is filled with 5 seeds of vetiver plant which are inserted into plastic cups containing soil, gravel, stone, and coconut fiber to support the plant and then to be floated on the surface of wastewater sample with root is below the wastewater surface to be contacted for 28 days in a place with good sunlight exposure. After that monitoring was carried out on days 0, 7, 14, 21 and 28 to monitor plant conditions, as well as metal concentrations, Total Suspended Solid (TSS), and Ammonia in wastewater. The results showed the use of vetiver (Vetiveria zizanioides) and bacteria are able to reduce metal content of Iron (Fe) up to 15%-93%, Lead (Pb) 20%-100%, and Copper (Cu)18%-93%, and Ammonia 12%-99%. However, the use of vetiver (Vetiveria zizanioides) and bacteria is less efficient in reducing the concentration of Total Suspended Solid (TSS). The monitoring results of plant conditions also showed the growth of leaf length and new root growth each week although the leaf conditions also changes that were marked by the changes of some leaves to be dry and brown.

Keywords: *Balai Yasa Yogyakarta, Floating Treatment Wetland, Vetiveria zizanioides, Wastewater,*

ABSTRAK

Aktivitas perbengkelan Balai Yasa Yogyakarta PT. Kereta Api Indonesia secara rutin menghasilkan air limbah yang mengandung pencemar seperti logam, Total Suspended Solid (TSS), dan Amonia dan sulit diolah apabila hanya menggunakan pengolahan yang biasa saja. Maka dari itu diperlukan pengolahan khusus untuk air limbah yang terkontaminasi oleh pencemar tersebut yaitu menggunakan metode floating treatment wetland menggunakan tanaman vetiver (Vetiveria zizanioides) dan bakteri. Tujuan dari penelitian ini adalah untuk mengevaluasi kemampuan tanaman vetiver (Vetiveria zizanioides) dan bakteri dalam mengurangi kadar logam Besi (Fe), Timbal (Pb), dan Tembaga (Cu), Total Suspended Solid (TSS), dan Amonia pada air limbah di Balai Yasa Yogyakarta menggunakan metode floating treatment wetland. Air limbah dimasukkan kedalam box kontainer dan ditambahkan bakteri pada beberapa box kontainer hasil dari ekstraksi tanah di area Balai Yasa Yogyakarta yang tercemar limbah. Selanjutnya styrofoam berbentuk pipih dilubangi sebanyak 5 lubang dan kemudian setiap lubangnya diisi dengan 5 buah bibit tanaman vetiver yang dimasukkan kedalam gelas plastik berisikan tanah, kerikil, batu, dan sabut kelapa sebagai penyangga dan diletakkan terapung pada permukaan sampel air limbah dengan posisi akar berada dibawah permukaan air untuk dikontakkan selama 28 hari di tempat yang terkena sinar matahari. Selanjutnya dilakukan pemantauan pada hari ke- 0, 7, 14, 21, dan 28 untuk memantau kondisi tanaman, serta konsentrasi logam, Total Suspended Solid (TSS), dan Amonia pada air limbah. Hasil menunjukkan penggunaan tanaman vetiver (Vetiveria zizanioides) dan bakteri mampu menurunkan kadar logam Besi (Fe) sebanyak 15%-93%, Timbal (Pb) 20%-100%, dan Tembaga (Cu) 18%-93%, dan Amonia 12%-99%. Akan tetapi penggunaan tanaman vetiver (Vetiveria zizanioides) dan bakteri kurang efisien dalam mereduksi konsentrasi Total Suspended Solid (TSS). Hasil pemantauan kondisi tanaman juga menunjukkan pertumbuhan panjang daun dan pertumbuhan akar baru setiap minggunya walaupun kondisi daun juga mengalami perubahan yang ditandai dengan perubahan warna pada beberapa daun menjadi menjadi kering dan berwarna coklat.

Kata Kunci: *Air Limbah, Balai Yasa Yogyakarta, Floating Treatment Wetland, Vetiveria zizanioides*