A PRELIMINARY STUDY ON THE USE OF ALTERNATIVE CHEMICALS FOR TREATMENT OF WASTEWATER IN COAL FIRED POWER GENERATION

GUNASEGRAN A/L A.RAMASAMY

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Name of Candidate: **GUNASEGRAN A/L A.RAMASAMY** (I.C/Passport No: **591027-07-5481**)

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Name: Ghufran Redzwan. Ph.D, Aff.MIEM
Designation: Penyelaras
Program Sains dan Pengurusan Alam Sekitar
Institut Sains Biologi – Fakulti Sains
Universiti Malaya
50603 Kuala Lumpur

ABSTRACT

Hydrated lime is used for pH adjustment as part of the treatment process at the main wastewater treatment plant in Sultan Azlan Shah Power Station, Manjung. Many problems are encountered in usage of hydrated lime mainly in terms of handling. Manual labour is used to load hydrated lime into bag unloader and it is a messy job because some of the chemical spills and gets air borne. This is also a safety concern. The hydrated lime also frequently chokes the outlet of storage silo and is another manual job to clear the blockage. This study is important because replacement of hydrated lime with a suitable alternative chemical can be advantageous for smooth operation of the wastewater treatment plant. In this preliminary study the use of alternative chemicals for pH adjustment was studied using jar tests. The alternative chemicals tested are soda ash, sodium hydroxide and potassium hydroxide. The main criteria in judging the performance of the alternative chemicals are floc size and settling time between pH 9.0 to 9.5. All three chemicals performed well at pH 9.0. Settling time for soda ash increased to 12 minutes at pH 9.5 and was judged to be not suitable. Sodium hydroxide and potassium hydroxide were found to perform well at pH 9.5 with a settling time of four minutes. Amount of sludge generated was compared and found to be slightly higher for sodium hydroxide as compared with hydrated lime. Cost for using potassium hydroxide was calculated to be lowest but it incurs manual labour for charging up. Sodium hydroxide has the second lowest cost and existing pumps can be utilized to prepare the charges. Sodium hydroxide is already available in the wastewater treatment plant for pH adjustment for post neutralization purpose. It is concluded that the alternative chemical of choice suitable for use in the wastewater treatment plant is sodium hydroxide.

ABSTRAK

‘Hydrated lime’ digunakan untuk membetulkan nilai pH dalam proses rawatan di loji rawatan air buangan utama di Stesen Janakuasa Sultan Azlan Shah, Manjung. Banyak masaalah dialami semasa menggunakan ‘hydrated lime’ terutama dari segi penggendalian. Buruh kasar diperlukan untuk masukkan ‘hydrated lime’ ke dalam ‘bag unloader’ dan tempat itu menjadi tidak terurus disebabkan tumpahan bahan kimia ini dan juga debu bahan kimia ini berterbangan. Ini melibatkan masalah keselamatan pekerja. ‘Hydrated lime’ juga kerap menyumbat paip keluar dari tangki simpanannya dan ini memerlukan kerja-kerja senggaraan untuk membersihkan sumbat. Kajian ini adalah penting kerana dengan mengganti bahan kimia ‘hydrated lime’ dengan bahan kimia lain yang tidak mendatangkan masaalah-masaalah ini akan melancarkan operasi loji. Dalam kajian awal ini penggunaan bahan kimia lain untuk membetulkan nilai pH diuji menggunakan kaedah ‘jar tests’. Bahan kimia lain yang diuji adalah ‘soda ash’, natrium hidroksida dan kalium hidroksida. Kriteria untuk menuntukan prestasi bahan kimia lain adalah ‘floc size’ dan ‘settling time’ diantara pH 9.0 hingga 9.5. Ketiga-tiga bahan kimia ini berfungsi dengan baik pada pH 9.0. ‘Settling time’ untuk ‘soda ash’ meningkat kepada 12 minit pada pH 9.5 dan didapati tidak sesuai. Natrium hidroksia dan kalium hidroksida didapati berfungsi dengan baik pada pH 9.5 dengan ‘settling time’ selama empat minit. Berat ‘sludge’ yang dijana juga dibandingkan dan didapati lebih sikit untuk natrium hidroksida lebih jika dibanding dengan ‘hydrated lime’. Harga untuk kalium hidroksida didapati rendah tetapi ia akan melibatkan tenaga pekerja untuk masukkan kedalam tangki. Harga natrium hidroksida adalah kedua rendah dan boleh dimasukkan dengan menggunakan pam yang sedia ada. Natrium hidroksida sedia ada dalam loji rawatan air buangan dan

digunakan untuk betulkan pH. Adalah disimpulkan bahawa bahan kimia lain yang sesuai untuk loji rawatan air buangan ini adalah natrium hidroksida.

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I like to dedicate this work to my loving parents, wife Telagawate and daughters Karthini and Shantini.

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