

Studi Komprehensif Analisa Kinerja Reaktor Anaerobic Digester untuk Pengolahan Fatberg = Reactor Performance Analysis of Anaerobic Digestion in Treating Fatbergs: A Comprehensive Study

Haqal Aufarassya Anwar, author

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Abstrak

Fat, oil, and grease telah menjadi permasalahan baru terhadap kesehatan lingkungan. Fatbergs, yang dikenal juga sebagai fat, oil, and grease deposits dapat menyebabkan dampak merugikan bila pengelolaan fatberg tidak diterapkan. Co-digestion fatberg melalui anaerobic digestion (AD) sangat bermanfaat untuk memitigasi dampak negatif yang dihasilkan oleh fatberg. Pre-treatment fatberg secara fisik seringkali dipelajari dan dikembangkan untuk meningkatkan produksi biogas pada anaerobic digestion. Untuk mengoptimalkan co-digestion AD, kinerja reaktor AD dianalisa. Studi ini dilakukan dengan menganalisa parameter kunci dari AD. Tiga metode pre-treatment dilakukan kepada fatberg melalui pencacahan mekanis (M) hingga memiliki ukuran dibawah <2mm, pre-treatment secara termal (T) dengan memanaskan pada 90°C selama satu jam, dan dilengkapi dengan kombinasi kedua metode (MT). Hasil yang diperoleh menunjukkan bahwa pH melewati batas optimum (melebihi 8.0) mengindikasikan inhibisi oleh ammonia, degradasi COD dan VS meningkat hingga 22.66% dan 23.44% secara berturut-urut, rasio C/N sudah ideal sekitar 25 – 30, konsentrasi VFA juga meningkat sebanyak 48.4%, disertakan peningkatan produksi biogas dan persentasi metana sebanyak 25.52% dan 36.35 berturut-urut. Dari seluruh metode pre-treatment yang dilakukan, kombinasi mekanis dan termal merupakan metode paling baik untuk co-digestion fatberg untuk AD.

.....Fat, oil, and grease, has become a recent concern in environmental issues. Fatbergs, also known as fat, oil, and grease deposits will cause detrimental effects internationally if proactive measures are not implemented. Co-digestion of fatbergs for anaerobic digestion (AD) is highly beneficial in reducing the detrimental effects of FOG. Physiscal pre-treatment of fatberg has been studied and developed to enhance biogas production for anaerobic digestion. In order to optimize co-digestion of AD, the optimal reactor performance is analyzed. This study is conducted by analyzing the key parameters of AD. Three pre-treatment methods were applied to fatbergs being mechanical treatment (M) by shredding the fatbergs <2mm in size, thermal treatment (T) by heating at 90°C for 1 hour, and a combination of both methods (MT). Results show that pH went beyond the optimum range (above 8.0) indicating ammonia inhibition, COD and VS degradation show an increase up to 22.66% and 23.44% respectively, the C/N ratio was ideal ranging from 25 – 30, VFA concentration also show an increase up to 48.84%, alongside an increase in biogas yield and methane content up to 25.52% and 36.35% respectively. Among all the pre-treatment methods conducted, the combined mechanical and thermal pre-treatment resulted best for co-digestion of fatbergs through anaerobic digestion.