Pengaruh Kecepatan Putar Terhadap Karakteristik Biofuel Pada Reaksi Hidrogenasi Bio-oil Non-Oksigenat dengan Self-Inducing Impeller = Effect of Impeller Rotational Speed on Biofuel Characteristics in Non-Oxygenated Bio-oil Hydrogenation Reaction using Self-Inducing Impeller

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Abstrak

Bio-oil fraksi non-oksigenat memiliki kandungan alkena yang tinggi hal tersebut menyebabkan tingginya ignition delay time dan nilai kalor yang rendah jika dibandingkan dengan bahan bakar diesel komersial. Reaksi hidrogenasi diperlukan sebagai upgrading Bio-oil fraksi non-oksigenat agar dapat memiliki karakteristik mendekati bahan bakar diesel komersial. Tujuan dari penelitian ini adalah menentukan efek kecepatan putar impeller tipe flat blade turbine terhadap karakteristik biofuel produk upgrading Bio-oil fraksi non-oksigenat. Parameter yang dinilai mencakup kandungan ikatan rangkap, branching index, viskositas dan nilai kalor. Investigasi dilakukan terhadap kecepatan putar pengaduk reaksi hidrogenasi pada 200 s.d. 500 rpm dengan rentang 100 rpm. Kemudian dianalisis dengan menggunakan metode FTIR, GC-MS, H-NMR, dan viskometer. Penggunaan self-inducing impeller diharapkan dapat menghemat penggunaan gas hidrogen. Dari hasil penelitian ditemukan bahwa penggunaan self-inducing impeller berhasil mengkonveksi gas hidrogen ke dalam fasa liquid namun tanpa memerlukan suplai hidrogen yang kontinu sehingga penggunaannya lebih hemat. Peningkatan kecepatan putar pengaduk pada reaksi hidrogenasi menyebabkan peningkatan tingkat hidrogenasi Bio-oil untuk range 200 s.d. 400 rpm dan sedikit penurunan pada kecepatan putar 500 rpm karena terbentuknya vortex kearah posisi impeller. Biofuel pada kecepatan putar 400 rpm yang paling mendekati diesel komersial ditinjau dari HHV dan viskositas. Berdasarkan parameter branching index maka biofuel pada kecepatan putar 200 rpm yang paling mendekati diesel komersial.

.....Bio-oil non-oxygenate fraction has a high alkene content which causes high ignition delay time and low heating value when compared to commercial diesel fuel. Hydrogenation reaction is needed as upgrading process for non-oxygenate fraction Bio-oil in order to have the characteristics close to commercial diesel fuel. The purpose of this study is to determine the effect of the rotating speed of the flat blade turbine type impeller on the biofuel characteristics from upgrading process. The parameters assessed include the double bond content, branching index, viscosity and heat value. Investigations were carried out on the rotational speed of the hydrogenation reaction stirrer at 200 s.d. 500 rpm with a range of 100 rpm. Then analyzed using FTIR, GC-MS, H-NMR, and viscometer methods. The use of self-inducing impeller is expected to save the use of hydrogen gas. From the results of the study it was found that the use of self-inducing impeller succeeded in converting hydrogen gas into the liquid phase but without the need for a continuous supply of hydrogen so that it is more efficient. Increasing the stirring speed of the stirrer in the hydrogenation reaction causes an increase in the extent of hydrogenation for the range of 200 s.d. 400 rpm and a slight decrease in the rotational speed of 500 rpm due to the formation of vortex towards the impeller position. Biofuel at a rotational speed of 400 rpm which is most close to commercial diesel when viewed from HHV and viscosity. Based on the branching index parameters the biofuel at the rotational speed of 200

rpm which is the closest to commercial diesel.