

KAJIAN PENGGUNAAN *STATIC MIXING REACTOR* PADA PROSES PRODUKSI BIODIESEL SECARA KATALITIK DENGAN SISTEM *CONTINUE*

(*Assessment of Static Mixing Reactor on Biodiesel Production by Using Catalytic a Continuous System*)

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ABSTRACT

Production of biodiesel catalytically requires catalyst and stirring. Good stirring system will produce a homogeneous mixture between triglycerides and methanol. Good stirring can be generated with the use of static mixers. This paper studies the static mixing reactor with continuous system in production of biodiesel catalytically and optimizing the length of static mixer in order to obtain methyl ester level based on standard. The experiments were conducted with transesterification method using palm olein (RBDPO) and methanol with molar ratio 1:6, KOH catalyst of 0.5% and the reaction temperature of 65°C. Biodiesel production process used transien condition. Biodiesel production process with catalyst used two moduls of static mixer. The treatment was the length of the static mixer. The variations of the static mixer lenght were conducted by passing fluid one time through static mixer reactor after the temperature has been reached (A0 = 2 static mixer), passed two times through the static mixer reactor (A1 = 4 static mixers), passed three times through the static mixer reactor (A2 = 6 static mixers), and passed four times through the static mixer reactor (A3 = 8 static mixers). Results show that for each treatment had produced methyl ester content above the standard of 96.5% w/w. The determination of the best treatment was obtained based on the best value for parameters of methyl ester and total glycerol resulted was on the condition of 4 times passed in the static mixer reactor (A3 = 8 static mixers) which produced methyl ester content of 97.92% w / w, total glycerol of 0.85%, acid number of 0.31 mg KOH / g, saponification number of 202 mg KOH / g, the biodiesel yield of 98.26%, and reaction time 29 minute.

Keywords: Catalytic biodiesel, static mixing reactors, static mixers, methyl ester content, yield

ABSTRAK

Produksi biodiesel secara katalitik membutuhkan katalis dan pengadukan. Sistem pengadukan yang baik akan menghasilkan campuran yang homogen antara trigliserida dan metanol juga dapat dihasilkan dengan penggunaan *static mixer*. Tulisan ini mempelajari rancangan *static mixing reactor* dengan sistem *continue* pada proses produksi biodiesel secara katalitik dan mencari panjang *static mixer* yang dibutuhkan sehingga diperoleh kadar metil ester sesuai standar yang sudah ditetapkan. Percobaan ini dilakukan secara transesterifikasi menggunakan minyak *palm olein* (RBDPO) dan metanol dengan perbandingan molar 1:6 menggunakan katalis KOH 0,5%, dan suhu reaksi 65°C. Proses produksi biodiesel dilakukan pada kondisi transien. Reaktor *static mixer* yang digunakan terdiri dari dua buah. Perlakuan yang dikaji yaitu panjang *static mixer*, variasi yang dilakukan yaitu melewati satu kali menuju reaktor *static mixer* ketika suhu tercapai (A0 = 2 *static mixer*), dilewatkan dua kali menuju reaktor *static mixer* (A1 = 4 *static mixer*), dilewatkan tiga kali menuju reaktor *static mixer* (A2 = 6 *static mixer*), dan dilewatkan empat kali

menuju reaktor *static mixer* ($A3 = 8$ *static mixer*). Hasil penelitian menunjukkan bahwa untuk masing-masing perlakuan menghasilkan kadar metil ester diatas standar yang ditetapkan sebesar 96,5% w/w. Penentuan perlakuan terbaik diperoleh berdasarkan nilai terbaik pada parameter kadar metil ester dan gliserol total yang dihasilkan pada kondisi 4 kali dilewatkan reaktor *static mixer* ($A3 = 8$ *static mixer*) menghasilkan kadar metil ester sebesar 97,92% w/w, gliserol total 0,85 %, angka asam 0,31 mg KOH/g, angka penyabunan 202 mg KOH/g, rendemen biodiesel sebesar 98,26%, dan waktu reaksi 29 menit.

Kata kunci: Rancangan, *Static Mixing Reactor*, kadar metil ester, waktu reaksi