

Literature Review Pemanfaatan Gas Sintetik Hasil Gasifikasi Sekam Padi Sebagai Bahan Bakar Spark- Ignition Engine = Literature Review of the Utilization of Synthetic Gas from Biomass Rice Husk Gasification as a Fuel for Spark Ignition Engine

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Abstrak

Salah satu alternatif dalam mengatasi permasalahan penyediaan kelistrikan di daerah 3T (Terdepan, Terluar, dan Tertinggal) yaitu melalui PLTBm sekam padi. Sekam padi yang tersedia secara besar menjadi suatu potensi untuk dijadikan feedstock dalam proses gasifikasi, selanjutnya gas sintetik digunakan sebagai bahan bakar mesin untuk memutar generator. Lab Gasifikasi FTUI saat ini sedang berfokus kepada program riset berbasis komersialisasi dalam pembuatan PLTBm skala kecil untuk daerah 3T. Namun belum adanya penelitian pemanfaatan gas sintetik melalui spark-ignition engine di Lab Gasifikasi FTUI, sehingga dibutuhkan studi literatur pemanfaatan gas sintetik sekam padi sebagai bahan bakar spark-ignition engine. Penelitian ini berfokus kepada pengumpulan informasi untuk mengetahui karakteristik gas sintetik sekam padi, unjuk kerja pembersihan gas sintetik di Lab Gasifikasi FTUI, dan pemanfaatan gas sintetik sebagai bahan bakar spark-ignition engine. Dari studi literatur, karakteristik gas sintetik sekam padi yaitu: penyusun utama yaitu H₂, CO, CH₄, CO₂, dan N₂, LHV rendah, terdapat tar, serta terdapat variasi komposisi setiap waktunya. Gas sintetik mampu dijadikan sebagai bahan bakar spark-ignition engine meskipun terdapat penurunan daya akibat rendahnya nilai LHV, namun emisi yang lebih bersih terhadap CO, HC, dan NO_x. Parameter proses yaitu AFR, ignition timing, dan rasio kompresi memiliki pengaruh yang signifikan terhadap daya output dan emisi, sehingga dibutuhkan penyesuaian terhadap parameter tersebut. Rekomendasi pemanfaatan gas sintetik meliputi: meningkatkan LHV, meningkatkan kemampuan pembersihan gas sintetik, penyesuaian AFR, pengontrolan AFR otomatis, penyesuaian ignition timing, dan penggunaan mesin dengan rasio kompresi tinggi.

.....One alternative in overcoming the problem of providing electricity in rural areas is through the rice husk biomass gasification. Rice husk that has already available in those areas becomes potential in utilizing rice husk as a feedstock for the gasification process, then the synthetic gas is used as a fuel for spark-ignition engine to turn the generator. FTUI Gasification Laboratory is currently focusing on research to commercialization program for the development of small-scale biomass gasifier for rural areas. However, the absence of research on this topic before in FTUI Gasification Laboratory, therefore it is necessary to have a literature review focusing on the utilization of synthetic gas from rice husk biomass gasification as fuel for spark-ignition engines. This research focusing on collects information from various studies to gives an overview of the characteristics of synthetic gas from rice husk gasification, synthetic gas cleaning system performance at FTUI Gasification Laboratory, and the utilization of the synthetic gas through spark-ignition engine. From the literature, the synthetic gas from rice husk gasification is composed of the main constituent gases namely H₂, CO, CH₄, CO₂, and N₂, low LHV, has tar, and has variations in the composition of synthetic gas each time. Synthetic gas can be used as a fuel for the engine even though there is a decrease in power due to low LHV, but it gives cleaner emissions on CO, HC, and NO_x. Process parameters, namely AFR, ignition timing, and compression ratio have a significant effect on output power and emissions.

Therefore, the adjustments of those parameters are needed. Recommendations for using syngas as fuel for spark-ignition engine include increasing the LHV value, increasing syngas cleaning system performance, AFR adjustment, automatic AFR control, ignition timing adjustment, and using an engine with a high compression ratio.