



- (3) **Dr. Dominicus Danardono Dwi Prija Tjahjana, S.T., M.T.** Lahir di Surakarta, 14 Mei 1969. Pria yang memiliki NIP 196905141999031001 adalah staf pengajar di Fakultas Teknik UNS. Riwayat pendidikan tinggi yang berhasil diselesaikannya adalah tahun 1995 lulus sarjana (S-1) dari Universitas Gadjah Mada untuk bidang ilmu: Teknik Mesin, tahun 2004 lulus Magister (S-2) dari Universitas Gadjah Mada untuk bidang ilmu: Teknik Mesin, dan berhasil meraih gelar Doktor (S-3) dari Chonnam National University Korea Selatan untuk bidang ilmu: Teknik Mesin pada tahun 2012. Judul dan ringkasan Disertasi disajikan dalam bahasa English sebagai berikut.

A DESIGN OF GAS MIXER FOR SYNGAS ENGINE USING THREE-DIMENSIONAL CFD MODELING.

A gas mixer prototype is developed for mixing air and synthesis gas or “syngas” as a fuel. Syngas is being recognized as a viable energy source worldwide, particularly for stationary power generation. Syngas has a very low energy density, so a mixer with λ (ratio of actual to stoichiometric air-fuel ratio) in the range of 1.1 to 1.7 is expected. In this study, three-dimensional computational fluid dynamics (CFD) modeling is used to design venturi mixer, coaxial mixer and coaxial mixer with vortex generator.

CFD modeling is used to investigate and analyze the influence of the throat diameter, gas chamber thickness and gas exits diameter on mixer characteristics and performance of the venturi mixer. While on the coaxial mixer model, CFD is used to analyze the influences of the primary nozzle exit diameter, constant pressure mixing chamber geometry, constant area mixing chamber geometry, divergent passage geometry, syngas inlet position and primary nozzle exit position on the coaxial mixer characteristics and performance. To design appropriate vortex generator, computational models are used to analyze the influence of the mechanical tab angle, number of tabs and geometry on the mixing characteristics and performance of the coaxial mixer.

Attention is focused on the effect of mixers and vortex generator tabs geometry on the air-fuel ratio, pressure loss and mixing quality. Based on the numerical results, an optimized design of venturi gas

mixer, coaxial mixer and vortex generator is decided and made. The optimized design of the venturi mixer has λ in the range of 1.2 to 1.3, good mixing quality and pressure loss of 46 Pa on air flow rate 100 m³/h. The optimized design of the coaxial mixer has λ ranging from 1.1 to 1.7 corresponding to pressure losses from 28 to 19 Pa at 100 m³/h air-flow rate. The optimized design of coaxial mixer equipped with the proposed vortex generator has λ in the range of 1.1 to 1.7 corresponding to pressure loss in the range of 41.4 to 31.9 Pa at 100 m³/h air flow rate. At λ about 1.2 and 100 m³/h air flow rate, the mixing quality of the optimized venturi mixer, coaxial mixer and coaxial mixer equipped with vortex generator have coefficient of variation (CoV) of 0.67, 0.88 and 0.29 respectively.