Tanes Limpurimongkon 2013: Impacts of Parameters on CO Reductions in a Diesel Oxidation Catalyst of Diesel Dual Fuel Engines Using Design of Experiments. Master of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Assistant Professor Ekathai Wirojsakunchai, Ph.D. 112 pages.

A Diesel Dual Fuel (DDF) engine is an adapted diesel engine that uses natural gas and diesel fuel as the energy source at the same time. Natural gas is mixed with air at the intake manifold and then, diesel fuel is injected into combustion chamber directly. Based on the past DDF literatures, they were indicated that carbon monoxide (CO) emissions were more substantial at low load conditions than those when running in diesel engine modes. The catalytic converter that was installed to this diesel engine was, therefore, not capable to reduce CO emissions abide by to the emission regulation. Literatures indicated that the exhaust temperature, mass flow rate, oxygen concentration, CO concentration, and propane concentration may affect to CO conversions of the catalytic converter. In the present work, Design of Experiments (DOE) is employed to better the understanding of behavior and various factors that affect CO reductions in the catalytic converter. Once the knowledge is founded, the optimization of CO reductions in the catalytic converter at 50% and 90% is studied extensively.

Using Fractional Factorial Design for factors screening that not affect CO conversions, it is founds that the exhaust temperature, mass flow rate, oxygen concentration, and CO concentration affect CO conversions of the catalytic converter significantly. The optimization of these factors, by using Box-Behnken Design, indicate that 50% of CO conversions occur at the exhaust temperature of 180$^{o}$C in order to reduce the CO concentration of 6200 ppm which is the maximum amount emitted from the tested engine. 90% of CO conversion occurs at the exhaust temperature of 200$^{0}$C, the mass flow rate of 25 kg/h and the oxygen concentration of 16%.

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