

# ***ANALYSIS OF THE ADDITION OF HEAT EXCHANGER IN Muffler WITH VARIATION OF HOLE DIAMETER AND FLUID FLOW TO REDUCE EXHAUST GAS EMISSIONS IN VEHICLES***

By

**Estu Dian Nugroho**

*Automotive Engineering Study Program  
Engineering Department*

## ***ABSTRACT***

*This research was conducted as an effort to reduce the exhaust gas content of vehicles by using a tool in the form of a Shell and tube Heat exchanger and to find out the difference in reducing exhaust emissions before and after adding the tool. The variations of the tools used in this study were the size of the 8mm and 6mm Shell and tube pipe holes and the fluid flow rates of 2 lpm, 4 lpm and 6 lpm. The type of research used in this study is quantitative. The results of the research on reducing exhaust emissions using the addition of a Heat exchanger are as follows, exhaust gas CO, CO<sub>2</sub>, O<sub>2</sub>, HC before cooling is 2.76% Vol, 7.8% Vol, 6.2%Vol, 546 ppm. After cooling with the Shell and tube tool using 8mm and 6mm Shell and tube pipe holes and a fluid flow rate of 2lpm, 4lpm, and 6lpm the best reduction results were obtained using a variation of 6mm diameter and 6 lpm fluid flow with a yield of 1.91% Vol, 6.1 % Vol, 7.9 % Vol, and 302.7 ppm. The best reduction in this study using a hole diameter variation of 6mm and a fluid flow of 6lpm resulted in a reduction of CO gas of 31% compared to before cooling. reduction in CO<sub>2</sub> gas content by 22% compared to before cooling. The increase in O<sub>2</sub> gas was 27% compared to before cooling. 45% reduction in HC gas emissions after cooling. It can be concluded that by adding a Heat exchanger tool using 8 mm and 6 mm Shell and tube pipe holes and a fluid flow rate of 2 lpm, 4 lpm, and 6 lpm can reduce CO, CO<sub>2</sub>, and HC gas content and increase O<sub>2</sub> gas content.*

***Keywords*** : CO, CO<sub>2</sub>, O<sub>2</sub>, HC, Heat exchanger, Cooling, Modification, Exhaust,

*Fluid flow rate, Exhaust Emissions, Hole diameter*