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# Effects of Injection Pressure and Injection Timing to Exhaust Gas Opacity for a Conventional Indirect Diesel Engine

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**Abstract.** In relation to pollution control and environmental friendliness, the quality of exhaust gas from diesel engine needs to be considered. The influences of injection pressure and timing to exhaust gas opacity were investigated. A series of experiments were conducted in a one-cylinder conventional diesel engine with a naturally aspirated system and indirect injection. The default specification of injection pressure was 120 kg/cm<sup>2</sup>. To investigate the injection pressure, the engine speed was retained on 1000 rpm with pressure variations from 80 to 215 kg/cm<sup>2</sup>. On the other hand, the various injection timing (8, 10, 12, 16 degrees before TDC point and exact 18 degrees before TDC point) were used to determine their effects to exhaust gas opacity. In this case, the engine speed was varied from 1000 to 2400 rpm. The injector tester was used to measure injection pressure whereas the exhaust gas opacity was determined by the smoke meter. Those data were also statistically analyzed by product moment correlation. As the results, the injection pressure of diesel engine had a non-significant positive correlation to the exhaust gas opacity with  $r = 0.113$  and  $p > 5\%$ . Injection pressure should be adjusted to the specification listed on the diesel engine as if it was too high or too low will lead to the higher opacity. Moreover, there was a significant positive correlation between injection timing and the exhaust gas opacity in all engine speeds.

**Keywords:** Diesel engine, Injection pressure, Injection timing, Exhaust gas opacity, Product moment correlation