

Title	Effect of exhaust pipe system upon the performance characteristics of two-cycle diesel engine
Sub Title	
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Publisher	慶應義塾大学藤原記念工学部
Publication year	1964
Jtitle	Proceedings of the Fujihara Memorial Faculty of Engineering Keio University (慶應義塾大学藤原記念工学部研究報告). Vol.17, No.66 (1964.) ,p.48(4)- 49(5)
JaLC DOI	
Abstract	
Notes	Summaries of Doctor and Master Theses Doctor of Engineering, 1964
Genre	Departmental Bulletin Paper
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=KO50001004-00170066-0004

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Effect of Exhaust Pipe System upon the Performance Characteristics of Two-cycle Diesel Engine

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The various investigations concerning the effect of pressure variation of exhaust pipe system on the two-cycle engine have been done by many researchers. However, there are still many unsolved problems because not only the pressure wave in an exhaust pipe varies as the time goes, but also it varies complicatedly by the effect of various factors of engine.

This paper is divided into two parts. Part I treated the effect of exhaust pipe systems with various factors, such as, with diffusers, nozzles, bends or elbows, expansion chambers and manifolds, on the uniflow scavenged two-cycle diesel engine which has been recently used more often as an research object of exhaust turbo-charge.

As a result, it was found that the pulsation effect in an exhaust pipe becomes optimum when pulsation coefficient q is 0.24, 0.70, and 1.16, which are somewhat different from the results obtained before by other researchers. Therefore, the author made a theoretical consideration assuming the exhaust pulsation as a forced oscillation and found a fair coincidence between the theory and the experimental results. It was also found that for an engine operating in a variable speed range, the first favorable region where the length of an exhaust pipe is shorter than those in the second and the third regions is most preferable.

As to the exhaust pipes having diffusers and nozzles, their optimum lengths decided according to the experimental results were proved to be calculable by the impedance theory and the effect of other exhaust pipes with manifolds, bends or elbows and expansion chambers upon the performance characteristics of two-cycle diesel engine was made clear experimentally.

Part II treated the reflective conditions of pressure wave in exhaust pipe systems because it was found experimentally that the reflective conditions had a great effect on their performance. They were studied by the shock-tube method, which is theoretically reasonable, and with the results the experimental results in Part I were clearly explained.

Therefore, in this paper it is tried to analyze the phenomena of pressure wave in an exhaust pipe of internal combustion engine basing on the theory and the experiments which are different from what had been alrerdy reported by other researchers. The author found a new pulsation coefficient as an important factor by which these phemonema were explained and it was made basis of design of an exhaust pipe of

internal combustion engine. Moreover, the reflective conditions of pressure wave were studied by the shock-tube method by which the experimental results of UD 3 were explained.

As it is clear from the above, this paper consists of a series of research concerning the problems of the exhaust pipe systems of two-cycle diesel engine.