# Evaluation of Test Methods of In-used Vehicle Inspection and Maintenance for Taiwan’s Program


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**ABSTRACT**

Governments all over the world have put much more emphasis on air pollution control and set up more strict regulations for emission exhaust of motor vehicles year by year. From the certification of new vehicle mode, quality standard test of mass production manufacturing, marketing and using, to the end of discard, for a vehicle, the period of time during in-used condition is the longest period. In Taiwan, Idle test mode of emission exhaust is followed for in-used vehicles. From this study, we found the Idle test is not good enough to screen high-emitter vehicles. Users of high-emitter vehicles are not able to repair their vehicles in time because of the lack of emission pollution information. These vehicles diffused wasted gas unlimitedly and deteriorated the air quality furthermore. Therefore, it is very important to seek for more efficient and accurate alternative test methods for in-used vehicles. ASM and IM-240, with the characteristics of low-cost testing equipments, short test time and good identification rates, are current test procedures in U.S. for I&M program. In Taiwan, FTP75 (Federal Test Procedure) and NEDC(New European Driving Cycle) have been used for emission certification of new vehicles. We found the diesel vehicles used IM-240 and the petrol vehicles used ASM got highly correlation results with NEDC and FTP75. In limited test samples and different emission cutpoint, The test results cann’t demonstrate that adopt ASM and IM-240 test mode will rasied the failing vehicles of identification rate, Also not rasied the failing vehicles of commission error rate



Keywords : Certification of new vehicle、Inspection and Maintenance、omission error rate、commission error rate


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**REFERENCES**

1.行政院交通部，中華民國交通月報統計，2009 2.行政院環境保護署，”空氣污染排放清冊-[TEDS7.0]版2007年排放量更新結果排放分布”，民國九十六年 3.盧啟文，”使用中車輛污染與油耗特性之研究-汽油引擎車輛研究”，國立交通大學交通運輸工程研究所碩士論文，1987 4.Dilip Patel, Mark Carlock，” The Relative Benefits From The IM240 And ASM Tests Performed On Vehicles Tested In CARB ’ s I&M Pilot program ”， California Air Resources Board Mobile Source Division El Monte, California，1994 5.“ Development of a Proposed Procedure for Determining the Equivalency of Alternative Inspection and Maintenance Programs ”, U.S. Environmental Protection Agency, pp.8-14. 1997 6.USA EPA Office of Transportation and Air Quality, ” Acceleration Simulation Mode Test Procedures, Emission Standards, Quality Control Requirements, and Equipment Specifications Final Technical Guidance ”, pp.53-60. 1993 7.林志峰，”屏東縣機車行車型態與排放係數之調查”，國立中山大學環境工程研究所碩士論文，2000 8.吳欣璇，”使用中機車定檢成效評估與污染排放推估”，國立中興大學機械工程學系碩士論文，2001 9.吳哲坤，”自用小客車定檢週期延長外部影響之研究”，國立交通大學交通運輸研究所碩士論文，2001 10.彭柏鈞，”都會區機車行車型態與空氣污染物排放特性之調查”，國立成功大學環境工程學系碩士論文，2003 11.江鴻程，”汽車怠轉及動態之廢氣排放相關性分析與研究”，中華大學機械與航太工程研究所碩士論文，2005 12.行政院環境保護署，”使用中汽油車排氣保檢合一制度研擬及推動專案工作計畫”， 民國九十九年十一月 13.New Zealand Wellington PO Box 3175 Ministry of Transport,“ The New Zealand vehicle emissions screening programme ”, pp.23-26, 2004 14.“ Review of test procedures ”, http://uk-air.defra.gov.uk/reports/cat15/0408171324_Appendix2Issue3toPhase2report.pdf 15.曾郁婷，”小樣本常態性檢定之探討”，真理大學數理科學研究所碩士論文，民國九十七年七月 16.台北市監理處車輛檢驗統計資料，民國九十九年一月，http://www.mvo.taipei.gov.tw 17.高雄市監理處全球資訊網，高雄市車輛檢驗情形統計表，民國九十九年一月， http://mvdis1.kcg.gov.tw 18.交通部，”道路交通安全規則”，民國九十七年七月 19.檢測行車型態，www.dieselnet.com 20.行政院環境保護署，”柴油汽車第五期排放標準訂定專案工作計畫”，民國九十四年十一月 21.USA EPA Office of Transportation and Air Quality, ” Acceleration Simulation ModeTest Procedures, EmissionStandards, Quality Control Requirements, and EquipmentSpecifications ”, EPA420-B-04-011, 2004. 22. http://www.horiba.com/jp/automotive-test-systems/products/emission-measurement-systems/portable-emission-analyzers/details/mexa-584l-826/ 23.Cohen, J.Statistical power analysis for the behavioral sciences (2nd ed.), 1988 24.行政院環境保護署，”汽油汽車廢氣排放測試方法與程序”， 民國九十六年三月 25.USA EPA,I/M Costs, Benefits, and Impacts 26.USA EPA Office of Transportation and Air Quality, ” Major Elements of Operating I/M Programs ”, EPA420-B-03-012, 2003 27.William M. Pidgeon and Daniel J. Sampson and Paul H. Burbage IV and Larry C. Landman and William B. Clemmens and Erik Herzog and David J. Brzezinski and David Sosnowski, ” Evaluation of a Four-Mode Steady-State Test With Acceleration Simulation Modes As An Alternative Inspection and Maintenance Test for Enhanced I/M Programs ”, USEPA EPA-AA-AQAB-93-01, pp.53-60. 1993 28.榮泰生，”SPSS與研究方法”，五南圖書出版股份有限公司，民國九十八年三月。 29.Jonny Farnlund ,Christian Engstrom, The possibilities of producing an engine related test cycle deriving from driving sequences in real world traffic, 2002 30.行政院環境保護署，”使用中汽車排氣定檢管理規劃及系統整合作業專案工作計畫”，民國九十四年。 31.USA EPA,“ Inspection and Maintenance (I/M) Program Effectiveness Methodologies ”, 1998 32.USA EPA,“ IM240 & Evap Technical Guidance ”, 2000 33.“ Designing the I/M Test to Match the Technology and Meet the Goals ”, http://www.adb.org