Comparative Study on Regulated Emissions and Size-resolved Particle Emissions from Light-duty Truck Equipped with Common Rail Direct Injection Diesel and Turbocharged LPG Direct Injection Engine under Various Vehicle Test Conditions

INTRODUCTION

“Global warming issue” : CO₂ reduction should be carried out
- In Korea, CO₂ reduction in transportation
- “2030 GHG reduction plan” : 5.2 million ton
- Including electrification, F/E improvement
- Diesel and gasoline direct injection (DDI) engine have become popularized

“Urban area air quality issue” : Need for improvement on NOₓ and PM
- Diesel-NOₓ and GDI-PM emission problem
- Light-duty trucks (LDTs) are seriously affected
- The Korean Government’s announcement
- “Special Act on Fine dust reduction and management”; deregulation on LPG vehicle

“Use of alternative fuel issue” : Liquefied petroleum gas (LPG or Autogas)
- Superior vaporization characteristics
- Overcoming the direct injection disadvantage
- Turbocharged LPG direct injection (T-LPDi)
- Goal: CO₂/NOₓ/PM simultaneous reduction

RESEARCH METHOD

Under various vehicle test conditions, CRDI_{DIESEL} vs. T-LPDi_{LPG} comparative study

PARTICULATE EMISSIONS ANALYSIS

Engine Speed-Load Characteristics under Vehicle Test

GASEOUS EMISSIONS ANALYSIS

CONCLUSION AND DISCUSSION

Summary and Conclusion
I. Efforts on improving fuel economy and urban air quality (NOₓ, PM, etc.) are equally important.
II. T-LPDi engine concept showed a capability on reducing CO₂/NOₓ/PM simultaneously.
III. There are both need and room for further improvements on internal combustion engines.

Discussion
I. This research can help overview LDTs’ exhaust emission performances with LPG fueled DI engine technology.
II. Since LDTs have an influence on environments more than passenger cars, highly efficient and ecofriendly powertrain systems are necessary.
III. As an alternative, the T-LPDi scheme can be useful not only for LDTs but also for various passenger/commercial vehicle applications.