SOME OBSERVATIONS BASED ON COMPLEMENTARY INTERNATIONAL EVALUATIONS OF EDAR VEHICLE EMISSIONS REMOTE SENSING TECHNOLOGY

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The Technology: EDAR

(Emission Detection And Reporting)

- Down-facing DiAL VERSS
- Scans down onto road to remotely measure passing vehicle emissions
- Measures CO$_2$, CO, NO, NO$_2$, SO$_2$, HC* (e.g. discrete CH$_4$, C$_3$H$_8$, etc.), PM...
- One footprint for both heavy and light duty vehicles
Example EDAR deployment:
Marylebone Road, London, UK

EDAR units
(one Gases; one PM)

Reflector Strip

Example EDAR outputs:
Passing Vehicle Plume Image and Emissions Measurements
Project

CDPHE/ERG Simulated Exhaust Gas EDAR (Emissions Detection And Reporting) Study

EDAR Developers: HEAT LLC
Project Partners: Colorado Department of Public Health and Environment, Eastern Research Group

Project contact: Tim DeFries (ERG)

Project Implemented by: United States Environmental Protection Agency
Gas Audit Evaluation

EDAR (Boom Arm) Deployment

Simulated Exhaust Gas Release

Drive-through reference gas release sampling
  • Highly accurate/stable reference
  • Good measure of instrumental accuracy
Gas Audit Results

- Good agreement with references (\(R^2 > 0.99\) for CO and NO; \(R^2 > 0.95\) for HCs)
- Selectivity e.g. discrete hydrocarbons
Project

Birmingham and London EDAR (Emissions Detection And Reporting) Demonstration and Evaluation

EDAR Developers:

HEAT LLC

Project Partners:

King’s College London
University of Birmingham
University of Leeds

Project Funding:

DfT LOCAL TRANSPORT AIR QUALITY CHALLENGE INNOVATION GRANT
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Department for Transport
Real-world Comparison

- Real-world (challenging) deployment
- Drive-through comparisons
  - PEMS
  - SNIFTER (car chaser)
PEMS Comparisons

- Good agreement (within experimental limits)
- $R^2 > 0.95$ for NO/CO$_2$;
- $R^2 > 0.90$ for CO/CO$_2$ and PM/CO$_2$;
- $R^2 > 0.80$ for NO$_2$/CO$_2$ (but arguably least certain measurement)
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SNIFTER (car chaser) Comparisons
• Measurement required correction for post-exhaust chemistry (e.g. NO depletion by $O_3$)
SNIFFER (car chaser) Comparisons

- Good agreement (within experimental limits)
  - e.g. $R^2 > 0.85$ for NO/CO$_2$
- Results also indicate similar agreement for different vehicle types
Conclusions

From the CDPHE/ERG Simulated Exhaust Gas Study:

EDAR has:
• High instrumental accuracy (e.g., $R^2 > 0.99$ CO, NO; $>0.95$ HCs)
• Low drift and negligible speed dependency

From the UoB/UoL/KCL Real-world Comparison:

(In conventional use) EDAR was:
• In good agreement with other real-world measurement methods
e.g., NO/CO$_2$ $R^2 = 0.96$ and 0.86 for PEMS and SNIFER, respectively
• Results for NO$_2$ and PM were also highly encouraging

NOTE: while we cannot say unequivocally that EDAR performs as well in the real-world as it does relative to a simulated exhaust gas, we have no evidence that it does not

BUT more generally…

This combination provides a comprehensive basis for the independent third-party evaluation of EDAR (or VERSS) performance
Thank you
…and any questions?

Acknowledgments

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