

Supplementary Material

Energy saving and pollutant emission reduction by adding Hydrogen in a gasoline-fueled engine

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Table S1 Emission analyzer specification.

| Measurement Variable | Range | Measurement device | Zero Drift | Repeatability |
|----------------------|---------------|------------------------|--|-----------------------------|
| HC | 0-5000 ppm | HORIBA FIA-720 / FID | $\leq \pm 1\% \text{ FS}^1/24\text{h}$ | $\leq \pm 0.5\% \text{ FS}$ |
| NOx | 10-5000 ppm | HORIBA CLA-720A / CLD | $\leq \pm 1\% \text{ FS}^1/24\text{h}$ | $\leq \pm 0.5\% \text{ FS}$ |
| CO | 50 ~ 1000 ppm | HORIBA AIA-721A / NDIR | $\leq \pm 1\% \text{ FS}/24\text{h} (\geq 100 \text{ ppm})$ $\leq \pm 2\% \text{ FS}/24\text{h} (50 \leq C_m^2, < 100 \text{ ppm})$ | $\leq \pm 0.5\% \text{ FS}$ |

¹ FS: flow sensitivity

² C_m : measured concentration

Table S2 Speciation of chassis dynamometer

| Item | Property | Parameter | Repeatability |
|-----------------------|-------------------|-------------------------|------------------------------------|
| Chassis | Type | Schenck EMDY 48 | - |
| | Drum diameter | 1219.2 mm | - |
| Dynamometer Equipment | Maximal speed | 200 km hr ⁻¹ | $\leq \pm 0.05 \text{ km hr}^{-1}$ |
| | Maximum axis load | 5600 N | $\leq \pm 0.1\%$ |

Table S3 Speciation of test vehicle

| | |
|-------------------------|-----------------------|
| Engine Type | EW 10 J4 (RFR) |
| Bore × Stroke | 85 mm × 88 mm |
| Displacement | 1,997 cc |
| Type of Drive | Front wheel drive |
| Compression Ratio | 10.8 |
| Max Power (hp / rpm) | 137 hp / 6,000 rpm |
| Max Torque (kg-m / rpm) | 19.8 kg-m / 4,100 rpm |