



# Fuel Additive Evaluation

Conducted by Daelim Technology R&D Institute  
217-3 Shinsung-dong, Yuseong-gu, Daejeon, South Korea

Evaluated by Exhaust emission lab, Inha Technical College  
253 Yonghyeon-dong, Nam-gu, Incheon, South Korea

# Test Overview

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## ▶ Purpose

- ✓ Evaluating the effect of S-Cocktail on fuel efficiency
- ✓ Evaluating the effect of S-Cocktail on exhaust gas

## ▶ Date

- ✓ 12th Dec ~ 18th Dec 2014
  - ▶ Initial condition test 12th Dec 2014
  - ▶ S-Cocktail injection start 12th Dec 2014
  - ▶ Evaluating the effect of S-Cocktail 18th Dec 2014

## ▶ Test Car

- ✓ Hyundai NF Sonata Gasoline 2.0 L
  - ▶ 92,000 km aged
- ✓ Test Condition
  - ▶ Dyno Test with 1591 kg, Inertia weight

## ▶ Test Mode

- ✓ Constant Speed Mode
  - ▶ 40 ~ 70 km/h, Increasing 10 km/h (4th gear)
  - ▶ 60 ~ 120 km/h, Increasing 10 km/h (5th gear)
- ✓ CVS 75 Mode (equivalent to FTP 75 Mode)
  - ▶ Hot -start (Pre-warmed)

## ▶ Test Method

- ✓ After evaluating the initial condition, S-Cocktail was injected and performed 300 km, Field aging
- ✓ After Field aging, S-Cocktail was injected and performed evaluation.
  - ▶ S-Cocktail was injected through air duct.

## ▶ Data Analysis

- ✓ 1-second modal analysis

# View of experiment

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# Constant speed fuel economy test results

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## For the 4th speed

Speed [km/h]	40	50	60	70
Baseline FE [km/l] (a)	16.9	16.0	15.1	14.2
<b>Additive FE [km/l] (b)</b>	<b>19.4</b>	<b>17.8</b>	<b>16.7</b>	<b>15.3</b>
%Difference = (b-a)/a	+14.6%	+11.4%	+10.6%	+7.9%

## For the 5th speed

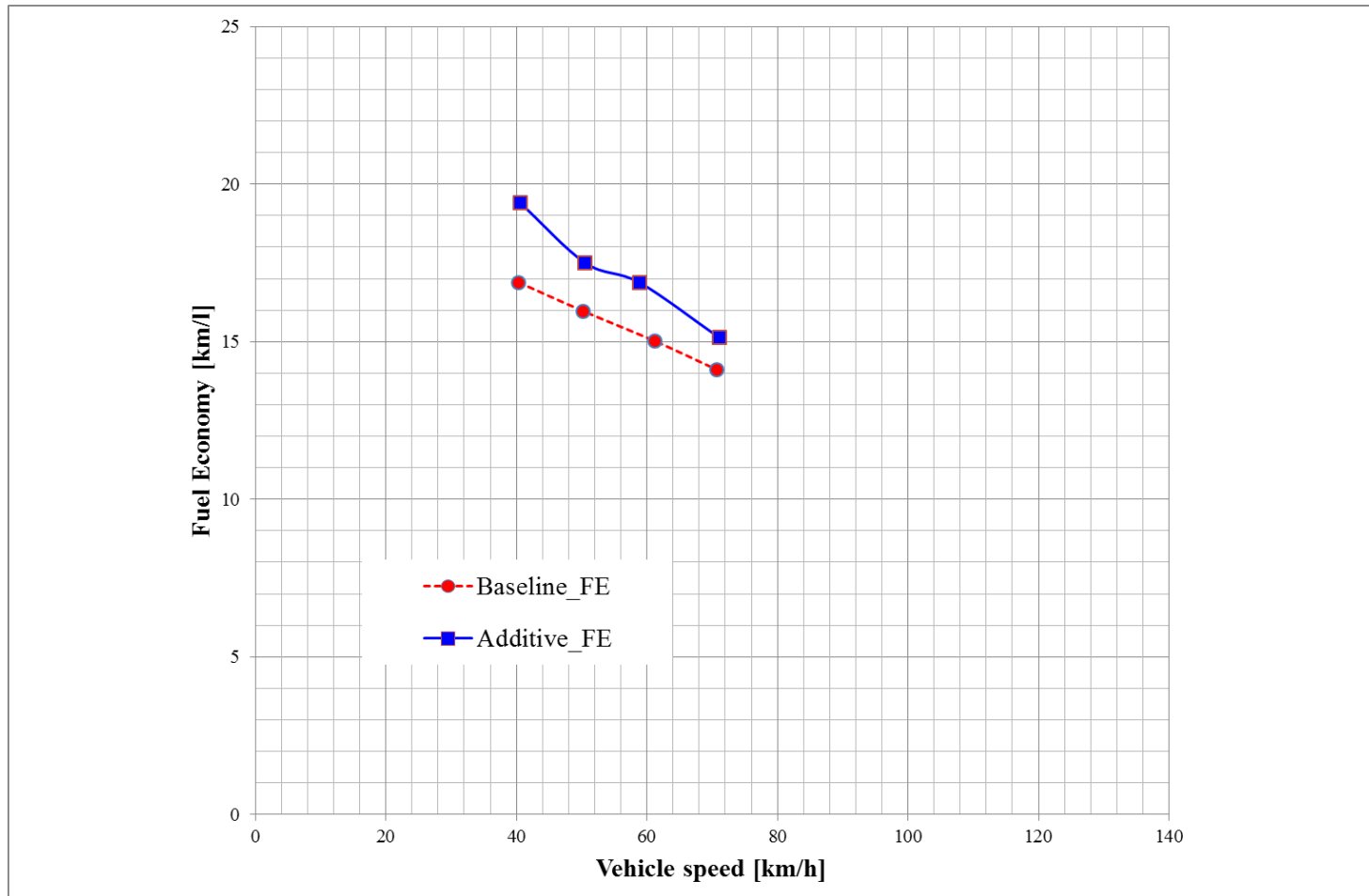
Speed [km/h]	60	70	80	90	100	110	120
Baseline FE [km/l]	16.5	15.6	14.6	13.5	12.4	11.1	9.8
<b>Additive FE [km/l]</b>	<b>17.6</b>	<b>16.8</b>	<b>15.7</b>	<b>14.6</b>	<b>13.2</b>	<b>12.4</b>	<b>11.3</b>
%Difference = (b-a)/a	+6.8%	+7.8%	+7.9%	+8.2%	+7.0%	+11.4%	+15.4%



# Constant speed Fuel Economy Data

for the 4<sup>th</sup> speed

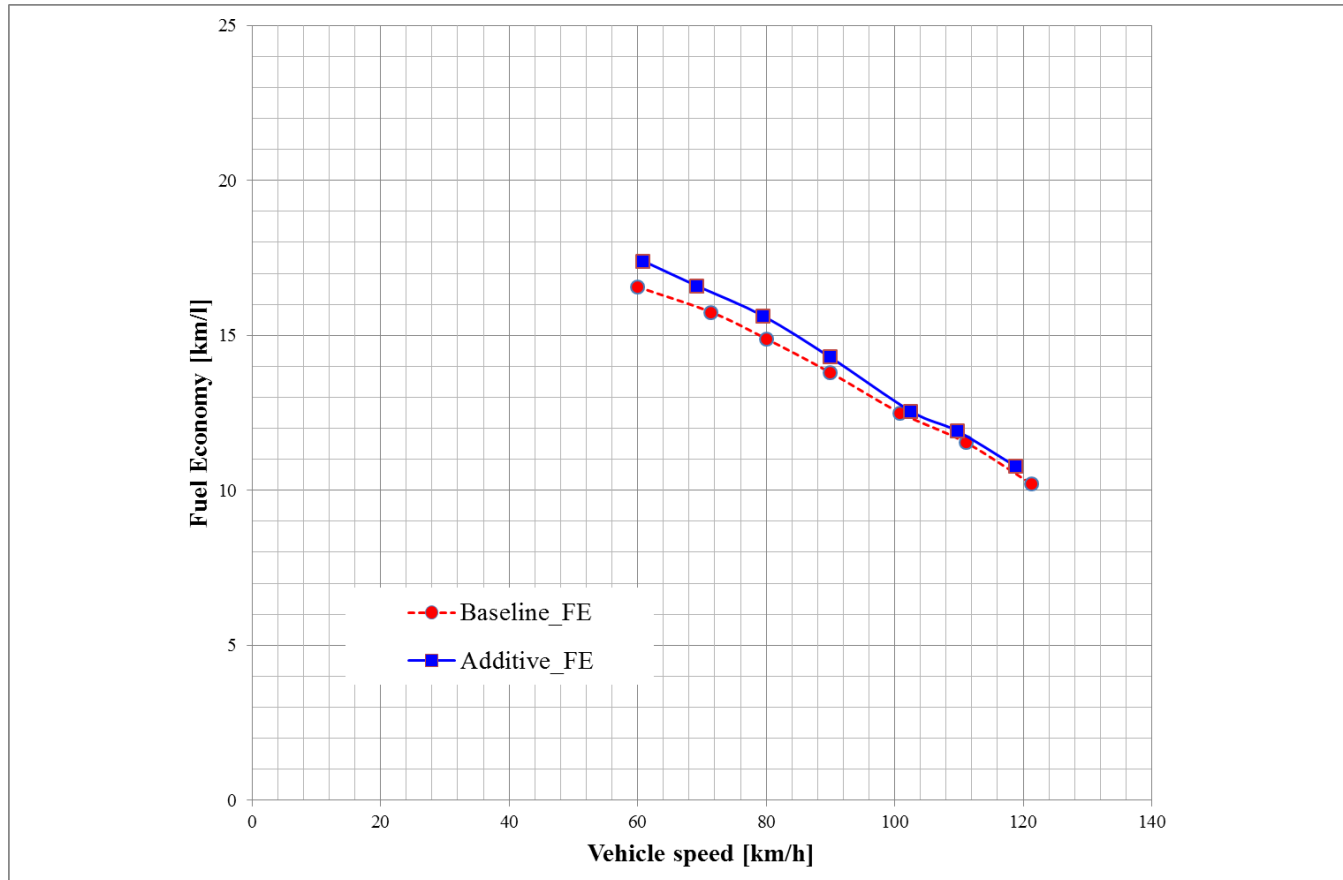
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# Constant speed Fuel Economy Data

for the 5<sup>th</sup> speed

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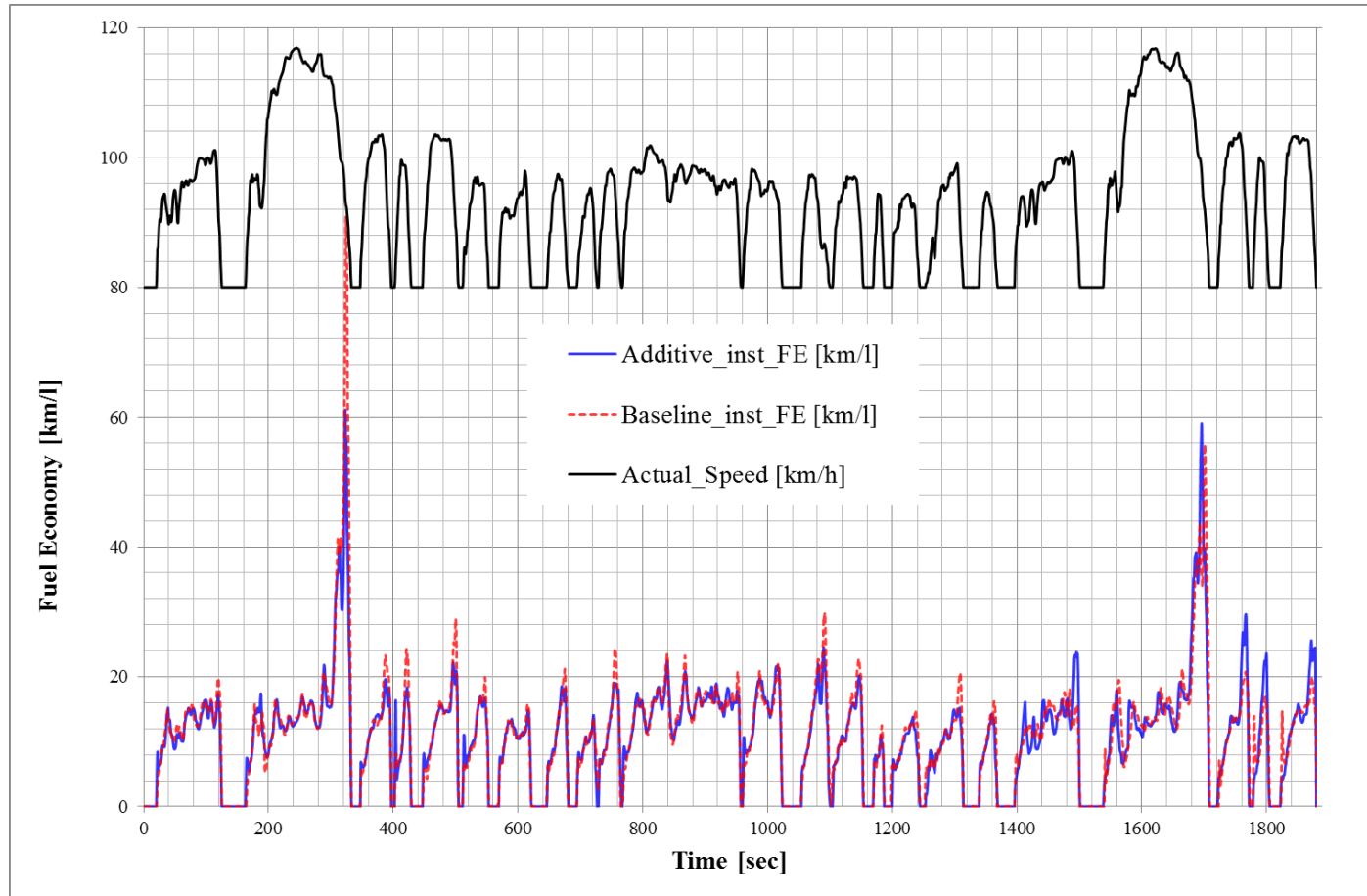
# CVS-75 mode test results

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	HC	CO	NO <sub>x</sub>	CO <sub>2</sub>	F/E
	g/km				km/l
Baseline(a)	0.001	0.352	0.023	193.4	12.09
Additive injection (b)	<b>0.001</b>	<b>0.393</b>	<b>0.012</b>	<b>194.3</b>	<b>12.03</b>
%Difference = (b-a)/a	-	11.8%	-48.7%	0.5%	-0.5%

# Instant fuel economy trend during CVS-75 mode driving

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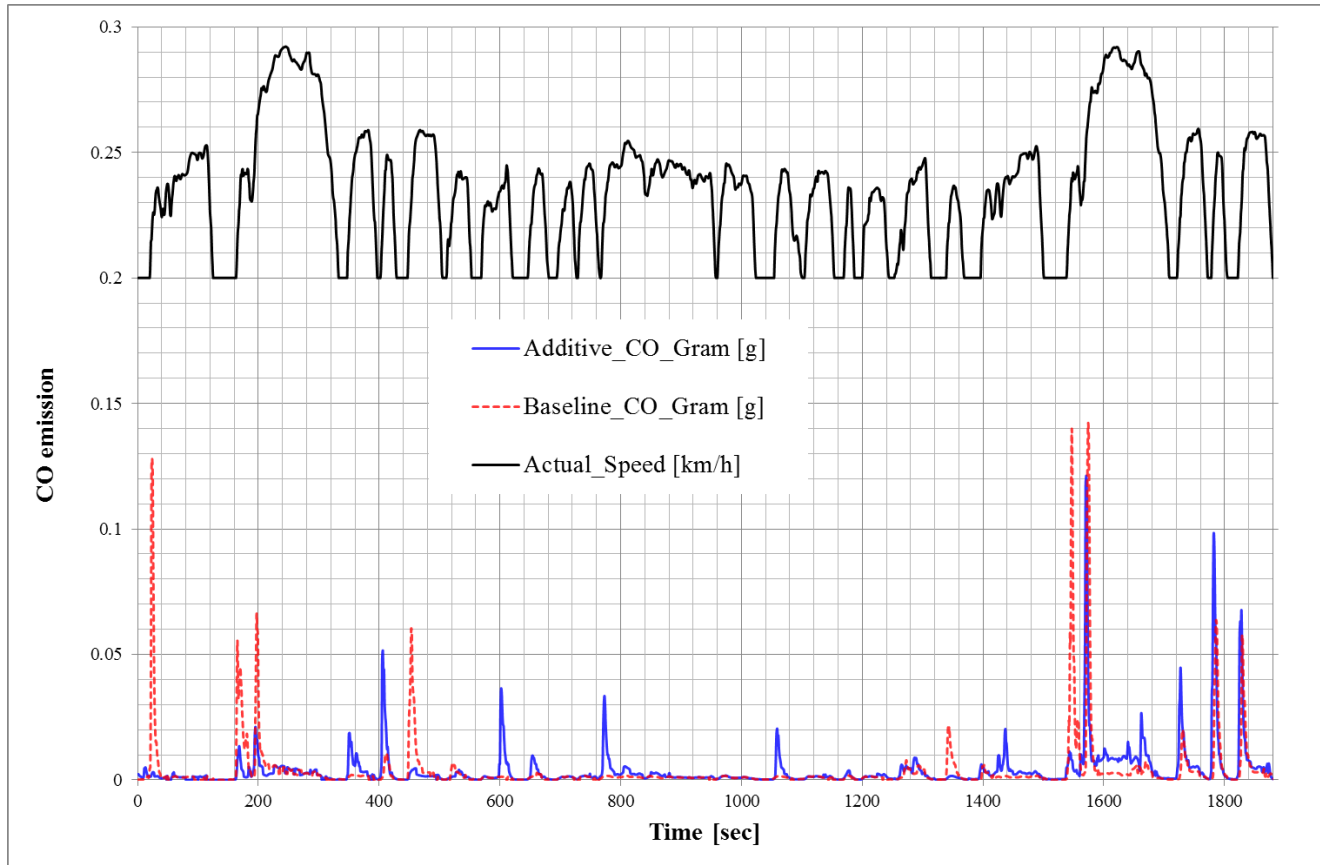




# CO emission trend

## during CVS-75 mode driving

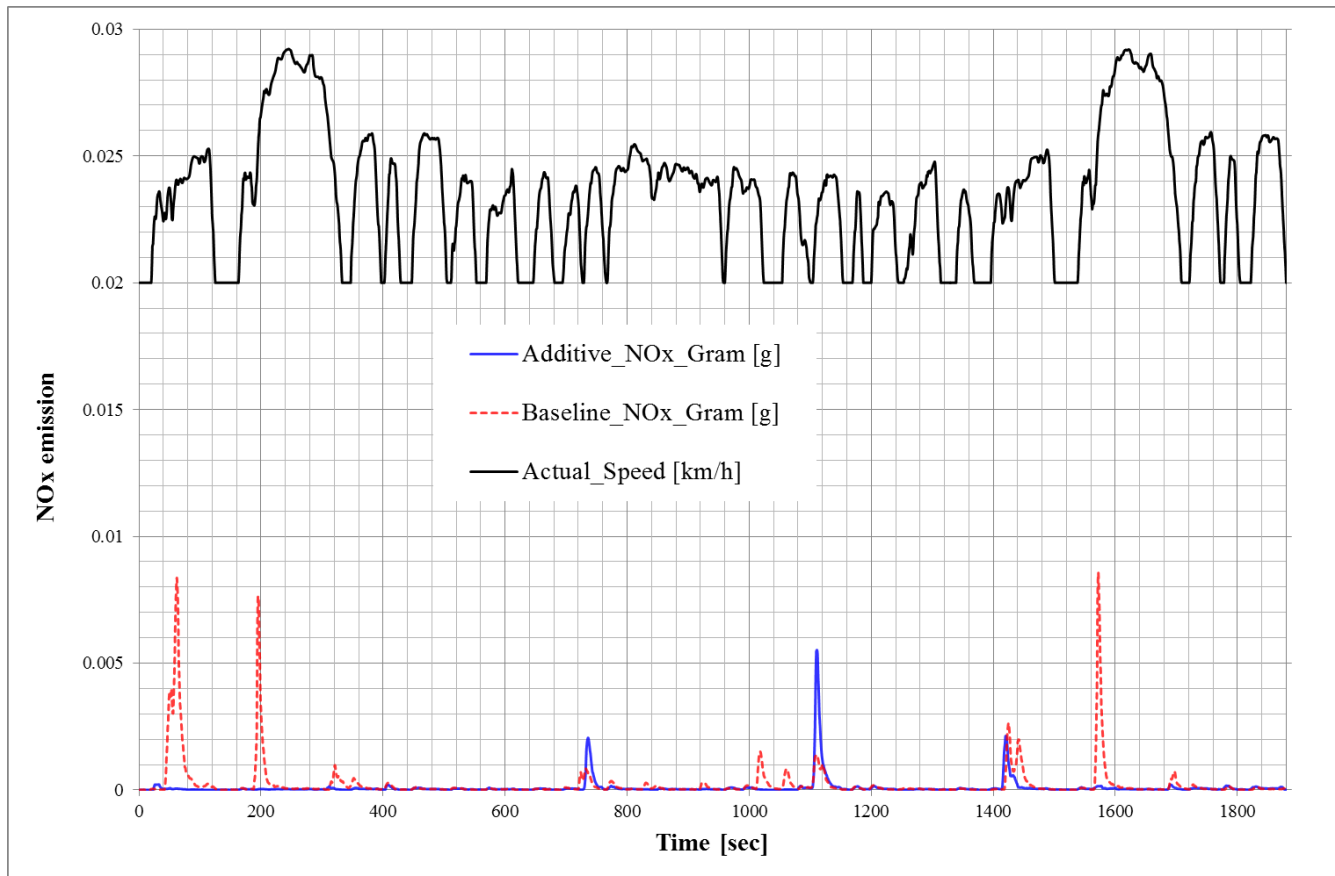
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# NOx emission trend

## during CVS-75 mode driving

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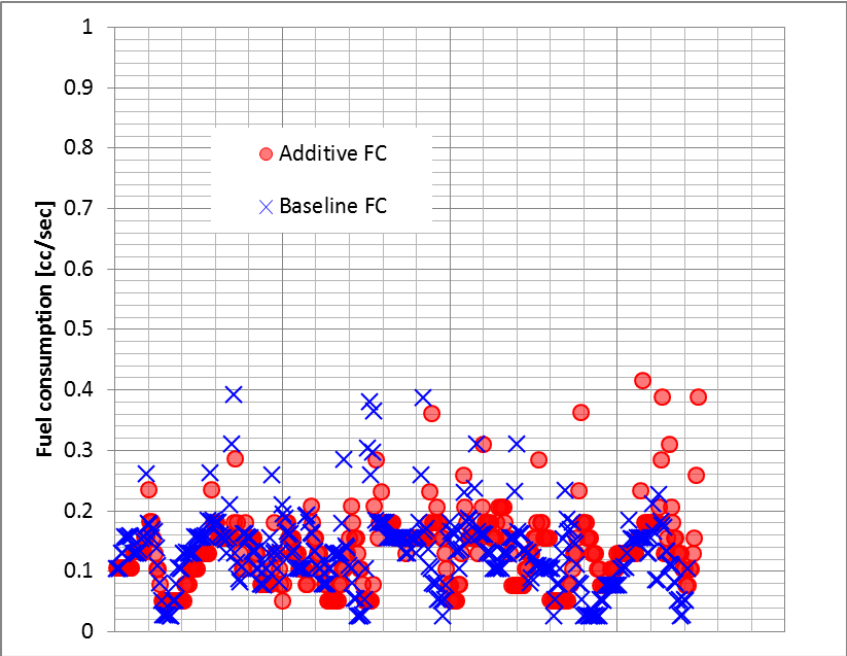
# Fuel consumption Data at Idling

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(Neutral Gear)

during CVS 75 mode driving

	Fuel consumption [cc/sec]
Baseline	0.131
Additive	0.135
<i>% difference</i>	<i>- 3.1%</i>



# Summary of Test

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## ➤ **Constant Speed Test**

- ✓ S-Cocktail improves fuel efficiency by 8 ~15% at 40 ~70 km/h with the 4th gear
- ✓ S-Cocktail improves fuel efficiency by 7 ~ 15% at 60 ~120 km/h with the 5th gear

## ➤ **CVS 75 Mode Test**

- ✓ S-Cocktail has no obvious improvement.
- ✓ S-Cocktail reduces NOx emission by 50%
- ✓ S-Cocktail induces 3% more consumption in an idling mode.

## ➤ **Supposed Reason for the difference between constant speed and CVS 75 modes**

- ✓ CVS 75 mode uses frequent change of combustion condition by frequently accelerating and decelerating. S-Cocktail has slow adaptation to the quick change.
- ✓ On the other hand, constant speed test does not involve change of combustion condition. S-Cocktail can show its effect on fuel efficiency.