

# A-PFI



System Techn. demand

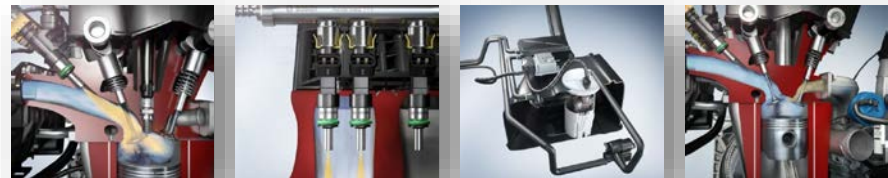


Erwin Franieck

GS/ENS-LA

# A-PFI E100

## Vehicle Configuration



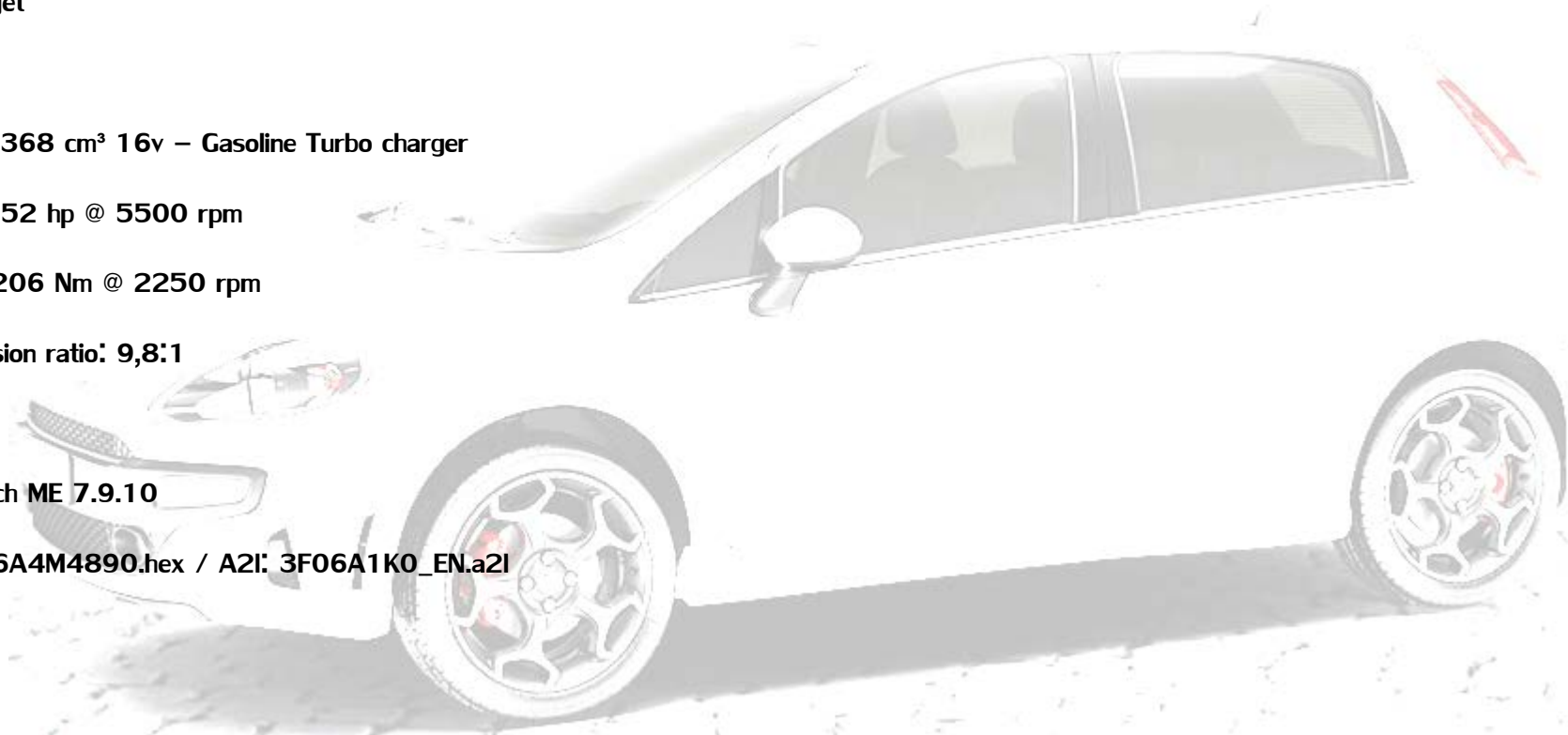
System Techn. demand

### Fiat Punto T-jet

- Engine 1.368 cm<sup>3</sup> 16v – Gasoline Turbo charger
- Power: 152 hp @ 5500 rpm
- Torque: 206 Nm @ 2250 rpm
- Compression ratio: 9,8:1

- ECU Bosch ME 7.9.10

SW/Cal: 6A4M4890.hex / A2I: 3F06A1K0\_EN.a2I

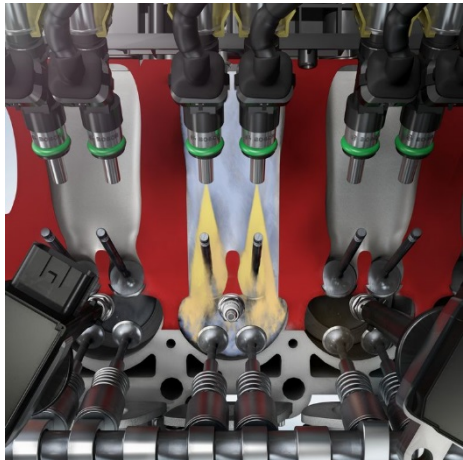


# A-PFI E100

**Target:** To increase the Efficiency and Emissions with E100.

These are the 3 steps of this project:

## Twin inj. changes



- + Injector flange
- + Cylinder overhead
- + Fuel rail

## DECOS changes



- + Fuel Pump Module
- + ECU Strategy (SW)
- Pressure regulator

## FlexStart changes



- + Heat Control Unit
- + Fuel rail
- + Heater
- + ECU Strategy (SW)

# A-PFI E100

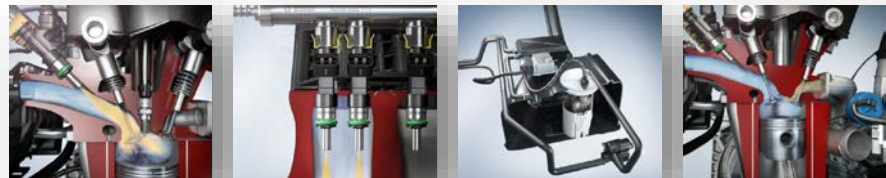
## FTP75 – E100 Baseline

### ► Tests

- Emission test w/ baseline single injector
- Emission tests @20°C
- Cold Start

### ► Emissions test

- RFM\_start = **1852**
- RFM\_postStart = **572**
  
- Cold Start limit achieved **+15°C**



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### ► FTP75 Emissions test result (summary)

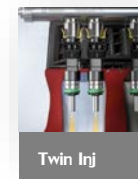
Baseline E100 4 injectors			
CO [g/km]	Nox [g/km]	NMHC [g/km]	NMHC-EtOH [g/km]
0,555	0,049	0,150	0,043

Limit		
CO [g/km]	Nox [g/km]	NMHC [g/km]
1,3	0,08	0,05

### ► Next step

- Cold start tests, emission tests with different approach combination.

- Twin injector



Twin Inj

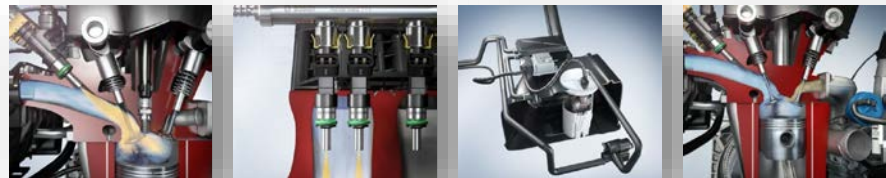
RFM\_start = Integrated relative fuel mass during the Start

RFM\_postStart = Integrated relative fuel mass during the postStart phase



# A-PFI E100

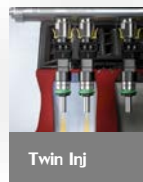
## FTP75 – E100 A-PFI (twin)



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### ► Tests

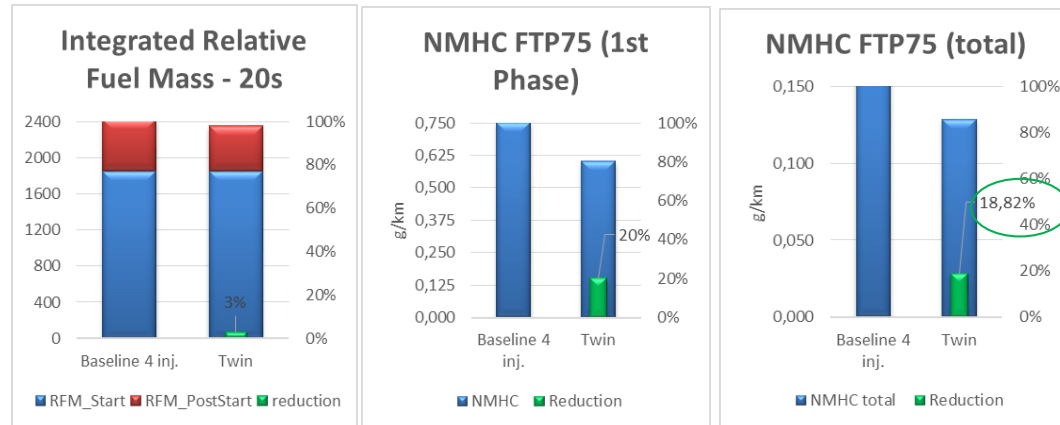
- Emission test with twin injector
- Emission tests @20°C
- Cold Start



### ► Results

- RFM\_start = 1858
- RFM\_postStart = 500 (-12,5% due to post start factor = 0)
- NMHC total = **-18,82% - OK**
- Fuel consumption during the FTP75 emission test = **-1,73% - OK**
- Cold Start Achieved **+10°C - OK**

### ► FTP75 Emissions test @ 20s

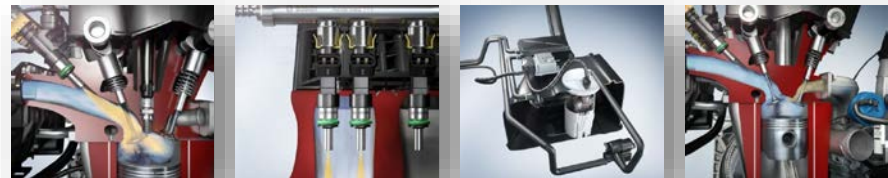


### ► FTP75 Emissions test (summary)

Twin Injector			
CO [g/km]	Nox [g/km]	NMHC [g/km]	NMHC-EtOH [g/km]
0,210	0,055	0,129	0,039

# A-PFI E100

## FTP75 – E100 Twin + DECOS

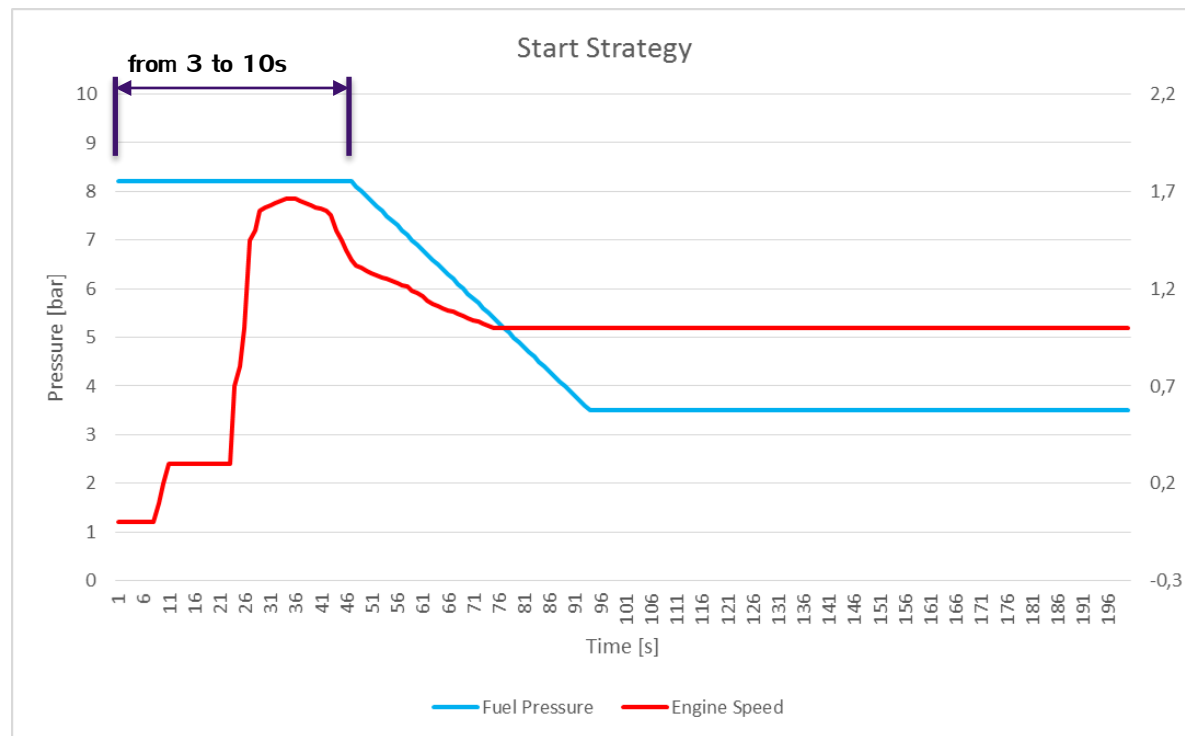


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➤ The fuel pressure is increased during the start from 3,5 bar (nominal pressure) to 8,0 bar.

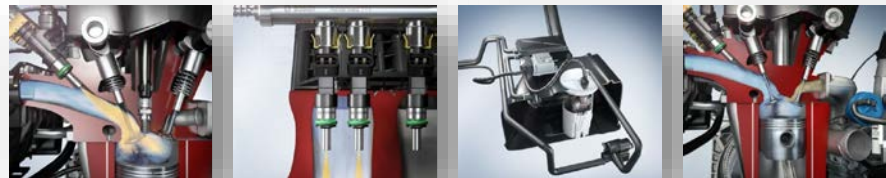
➤ Benefits:

- Decreased injection timing due to increased fuel pressure;
- Possible better vaporization and spray. (OVI)



# A-PFI E100

## FTP75 – E100 Twin + DECOS



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### ► Tests

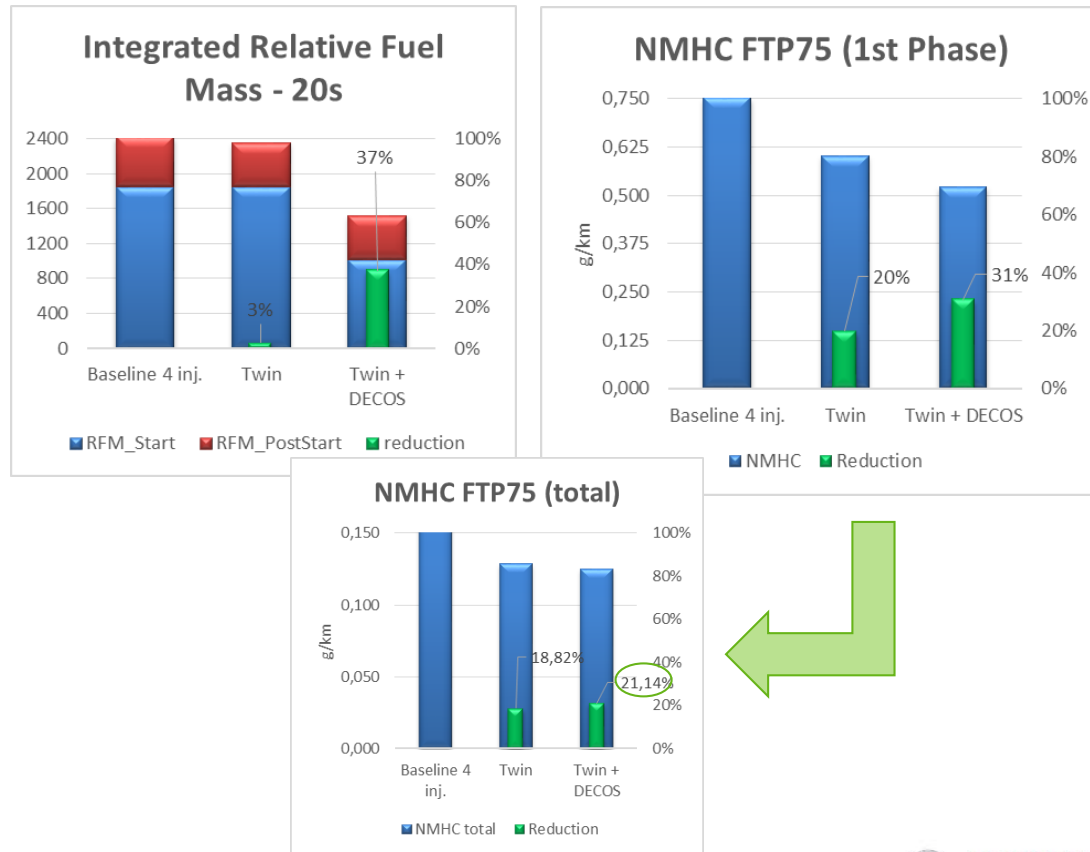
- Combination approach:
- Emission tests @20°C
- Cold start tests



### ► Results

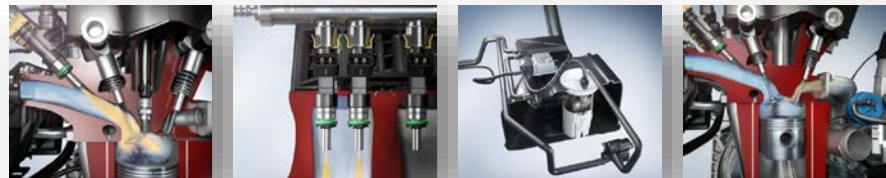
- Fuel mass reduction during the start: **-37%**
- NMHC total = **-21,14%** - **OK**
- Cold Start temperature achieved: **+5°C** - **OK**

### ► Cold start (emission test)



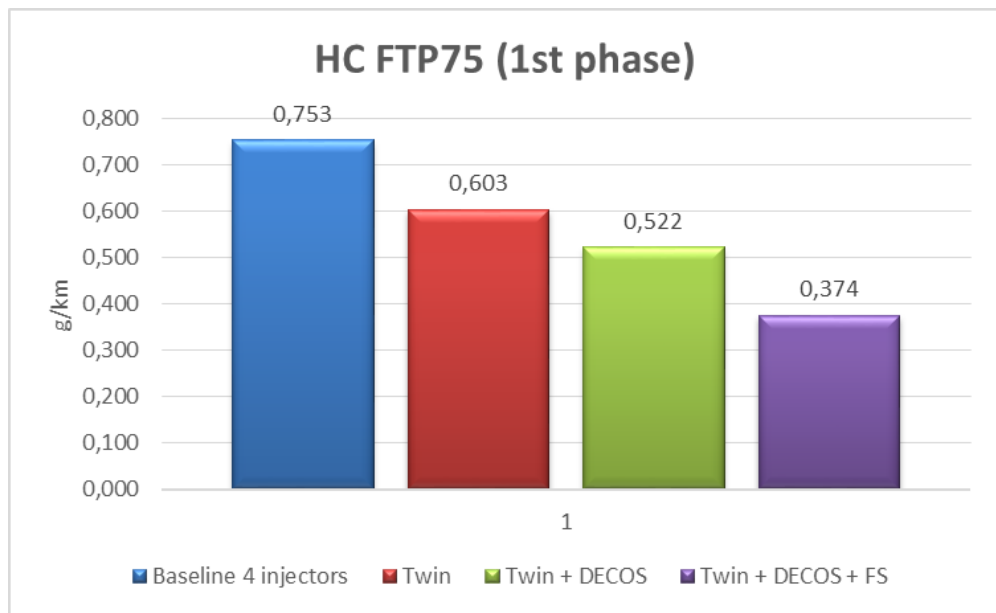
# A-PFI E100

## FTP75 – E100

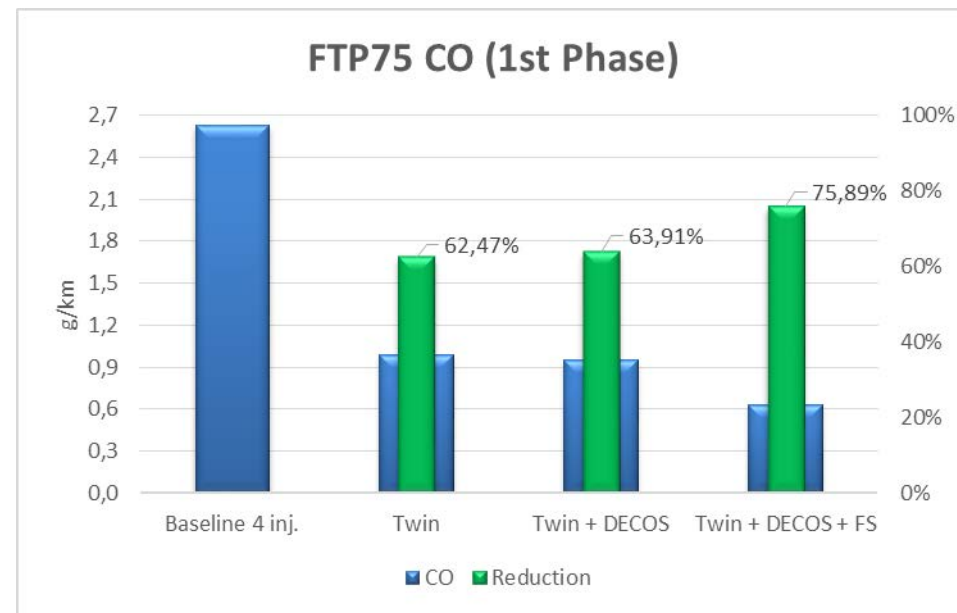


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### ► FTP75 Emission test comparison



HC reduction due to fuel mass reduction



CO reduction due to better combustion



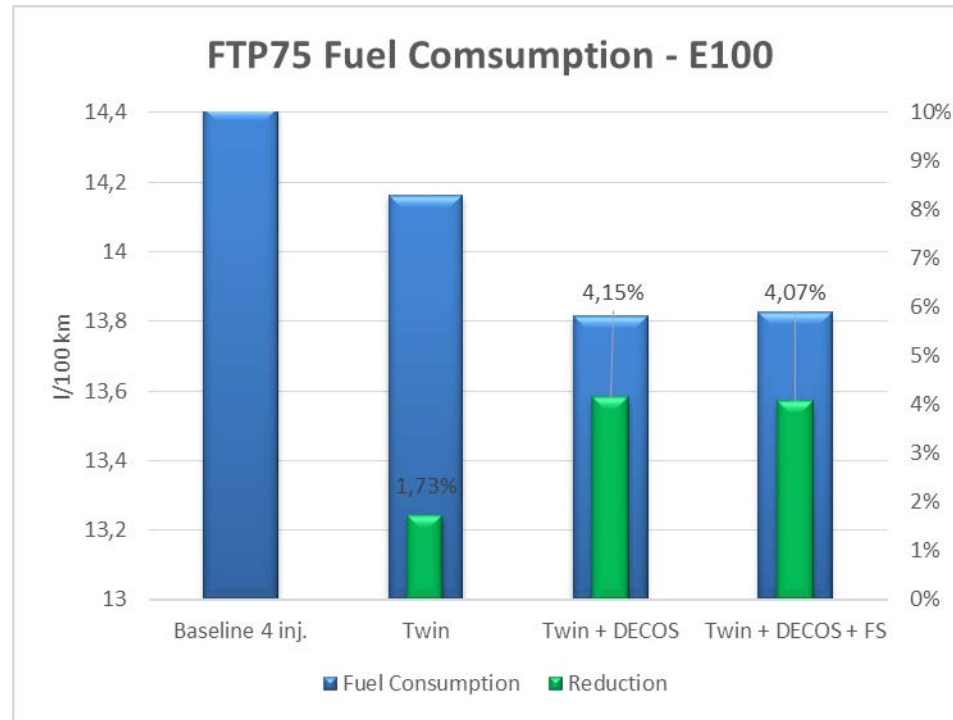
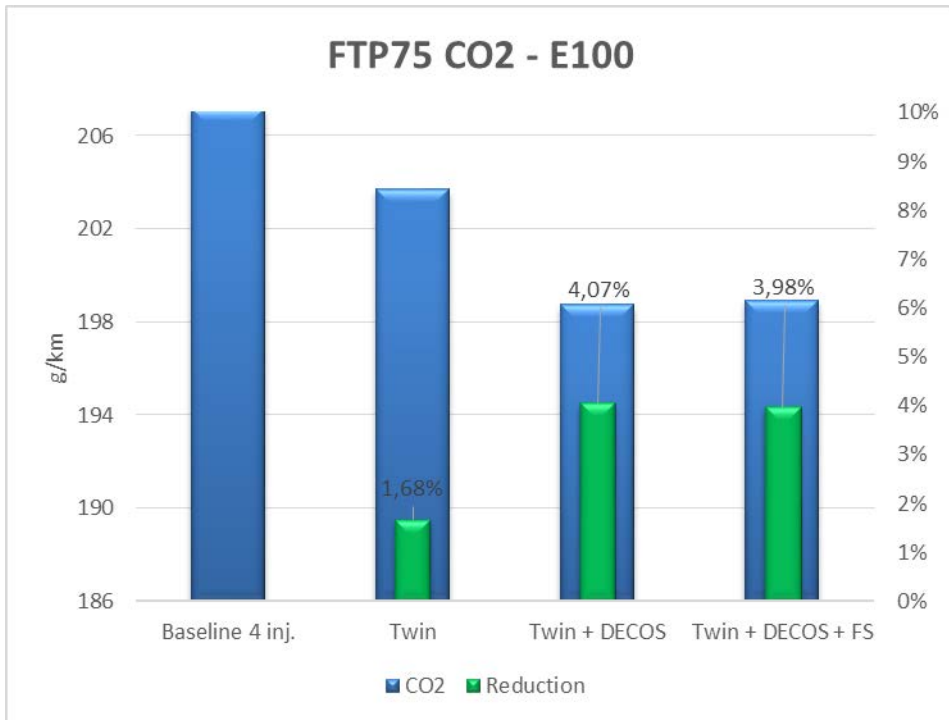
# A-PFI E100

## FTP75 – E100



System Techn. demand

### ► FTP75 Emission test comparison



## Conclusion:

- ✓ Reduction on fuel consumption achieved – **1,7% w/ A-PFI and 4% w/ all technologies;**
- ✓ Minimum Cold Start temperature w/o Flex Start – **+5°C**
- ✓ Reduction on NMHC achieved – **50%**