SEMINAR

"MEMBANGUN MODA TRANSPORTASI JALAN UNTUK SISTEM TRANSPORTASI MULTIMODA DAN LOGISTIK YANG EFEKTIF DAN EFISIEN DALAM MENGHADAPI MASYARAKAT EKONOMI ASEAN (MEA) 2015"

THE GOLF - PANTAI INDAH KAPUK - JAKARTA
RABU-KAMIS, 25-26 FEBRUARI 2015

SPONSOR:

MITRA APTRINDO:

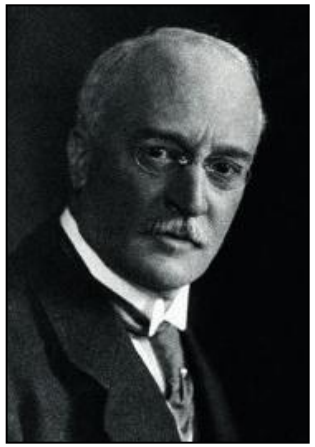
MEDIA PARTNER:

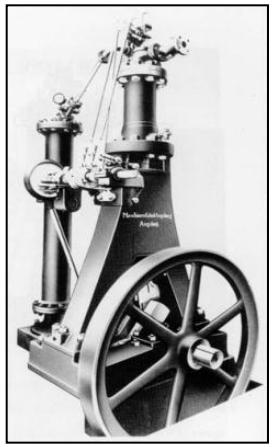
PT GAZINDO RAYA

Smart Diesel Dual Fuel Technology

History of Diesel Dual Fuel

- **1892:** February 23, Rudolf Diesel obtained a patent (RP 67207) titled "Arbeitsverfahren und Ausführungsart für Verbrennungsmaschinen".
- **1901:** the U.S. Patent Office issued to Rudolf Diesel patents covering all essential features of the dual fuel and gas diesel engines





Type of Diesel Conversion

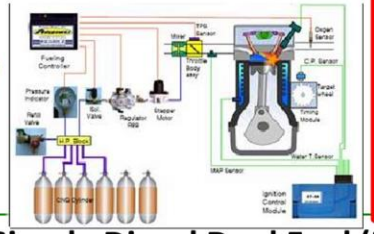
Light & Heavy Duty Truck (Diesel Engine)

Dedicated Gas Engine

Disadvantage
- Short Distance
- Lack of NGV Station

Spark Ignition Conversion

Disadvantage
- Conversion Cost
- Durability Issues



Simple Diesel Dual Fuel (DDF)

Disadvantage
- Bad Fuel Economy
- High Emission
- Engine Damaged Risk

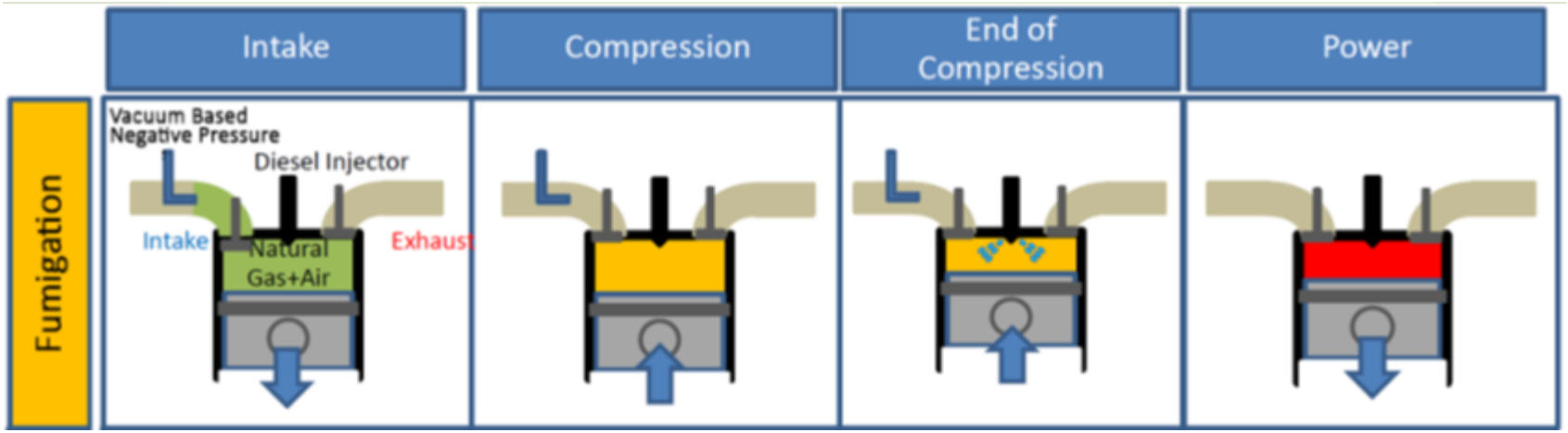
SMART DDF Technology

- High Energy Replacement
- Long NGV Distance
- No Engine Conversion
- Good Fuel Economy
- Lower Emission
- No Damaged Risk

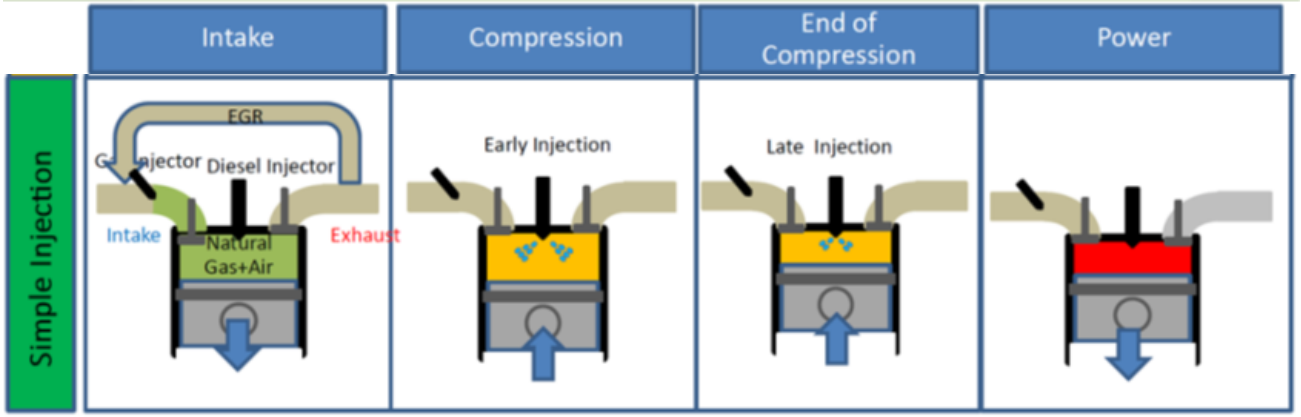
Diesel Dual Fuel Conversion Technologies

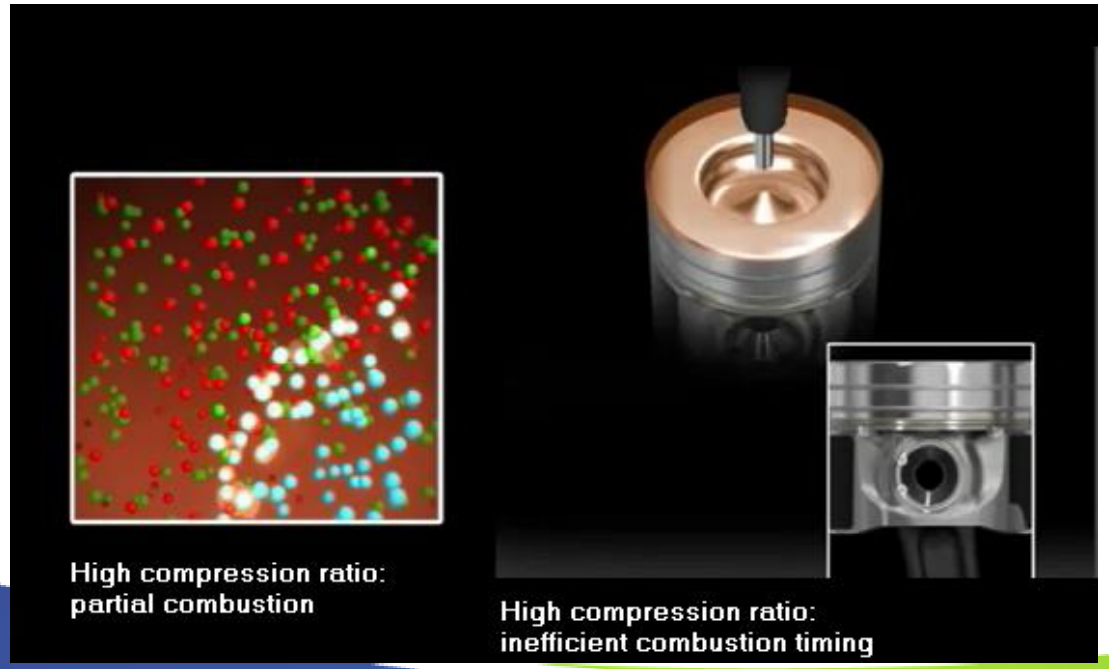
- Conversion Technology of Diesel Engines to CNG/LNG/LPG or Biogas
  - Fumigation System
  - Simple Diesel Dual Fuel (DDF) System
  - Smart Diesel Dual Fuel (DDF) Injection System

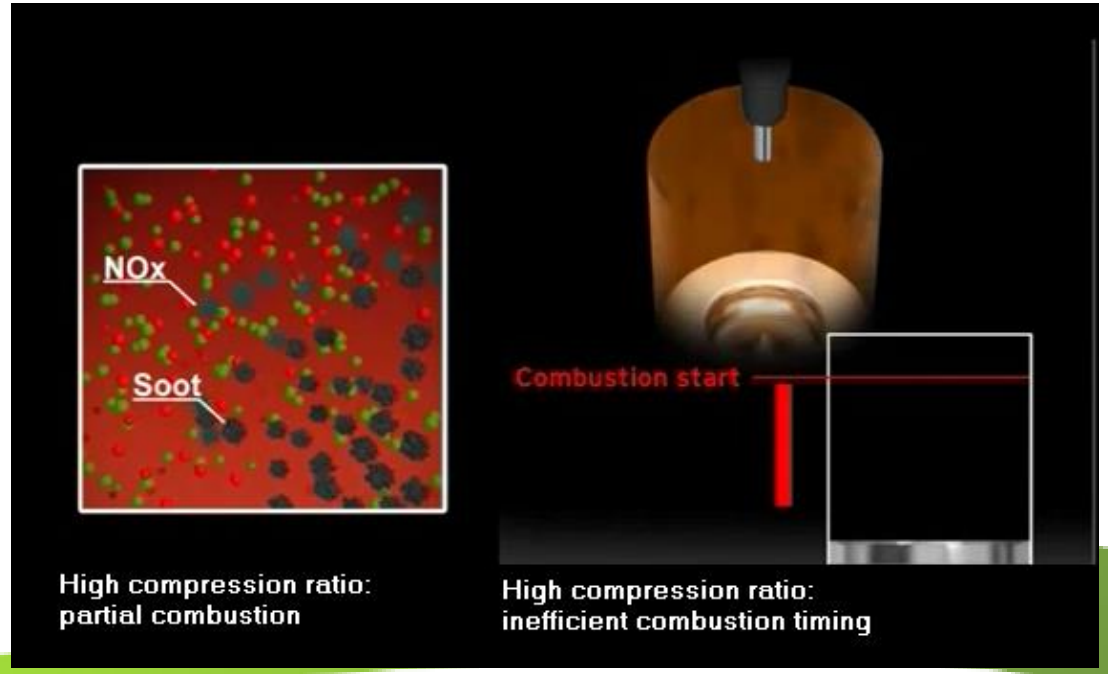
Fumigation


Intake
Compression
End of Compression
Power
Fumigation
Vacuum Based Negative Pressure
Diesel Injector
Intake
Natural Gas+Air
Exhaust

Simple DDF Technology

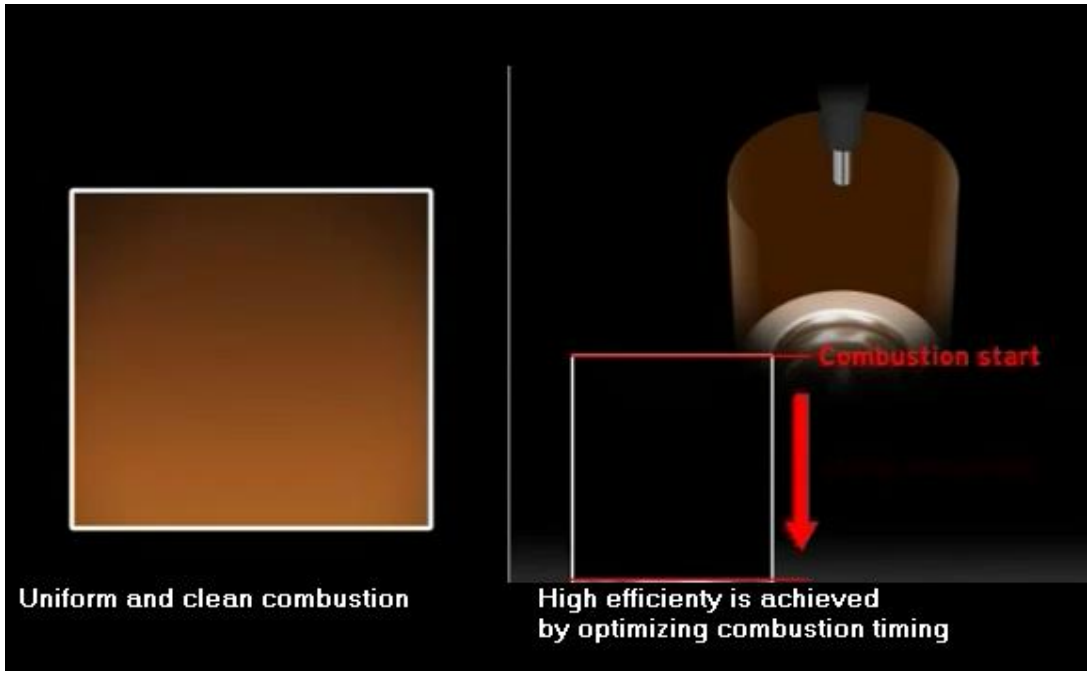


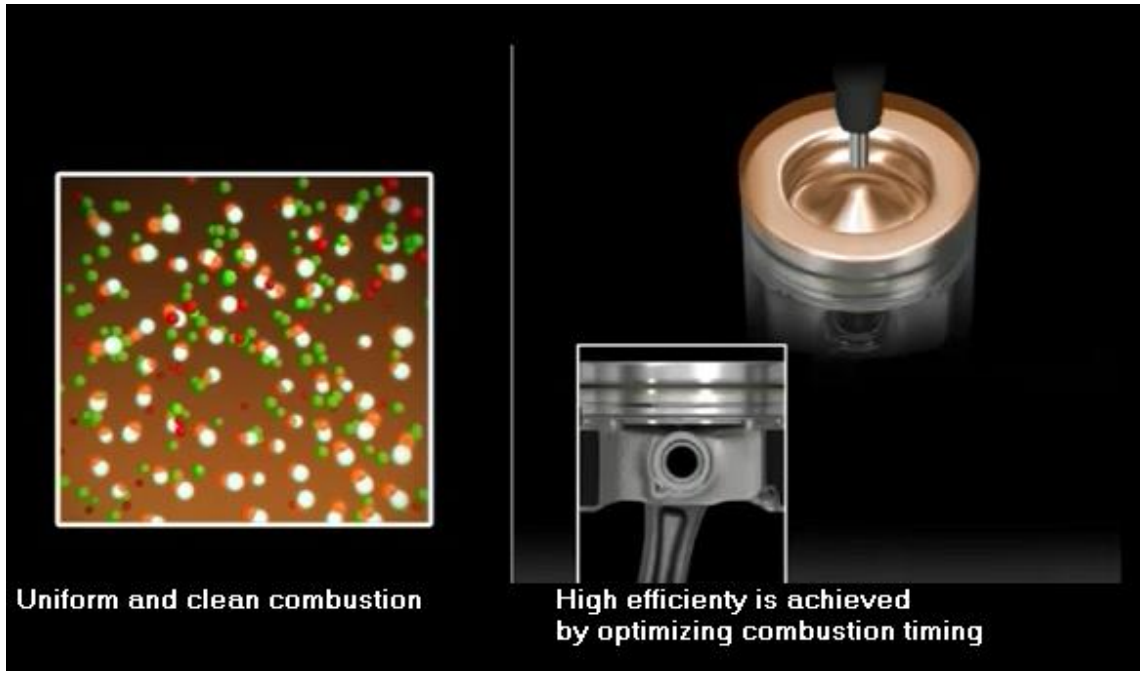




Smart DDF Technology:

Multi Ignition Point





Smart DDF Technology

Smart DDF Injection system

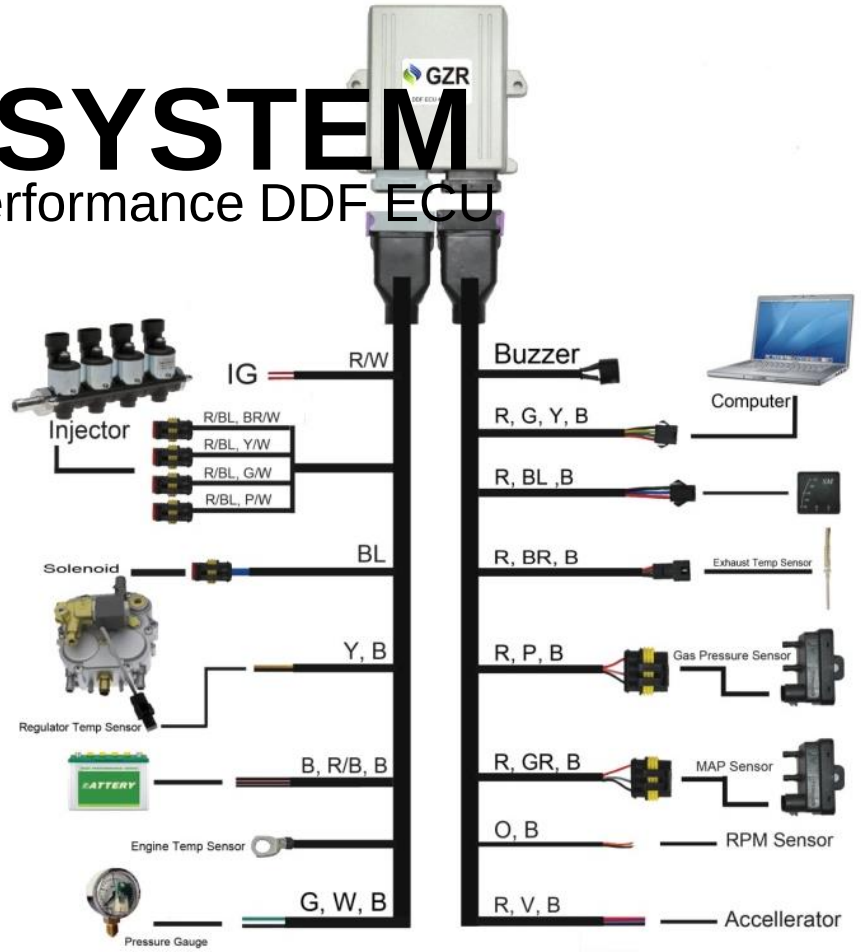
Advantages

- Ultra Fast 2 ms Injection Time
- Working pressure 2 – 6 barg
- High flowrate Injector
- 100% Cut Off
- Easy Installation
- Small in Size

Smart DDF SYSTEM

Excellent Safety & High Performance DDF ECU

GZR Diesel Dual Fuel Wiring Diagram

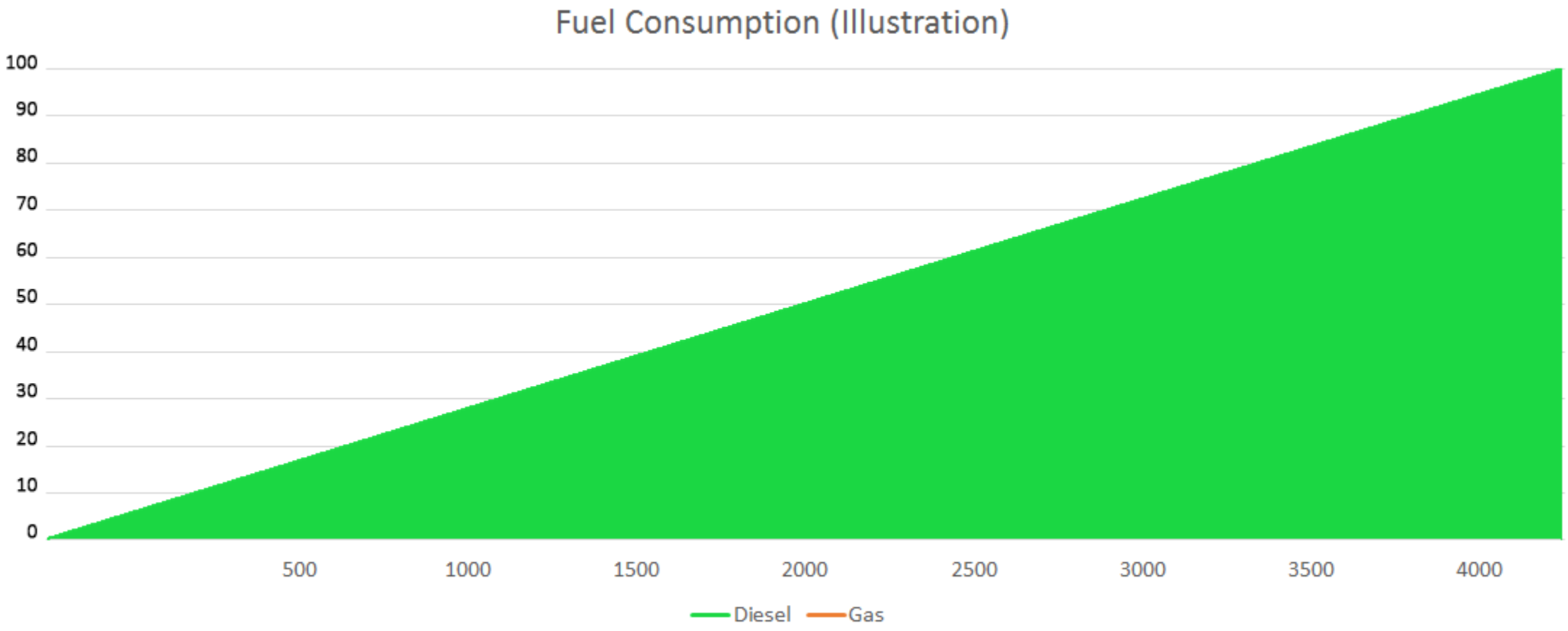


Note

R = Red	Y = Yellow	B = Black	BR = Brown	R/B = Red/Blaok
G = Green	W = White	O = Orange	BL = Blue	R/W = Red/White
V = Violet	P = Pink	GR = Gray		

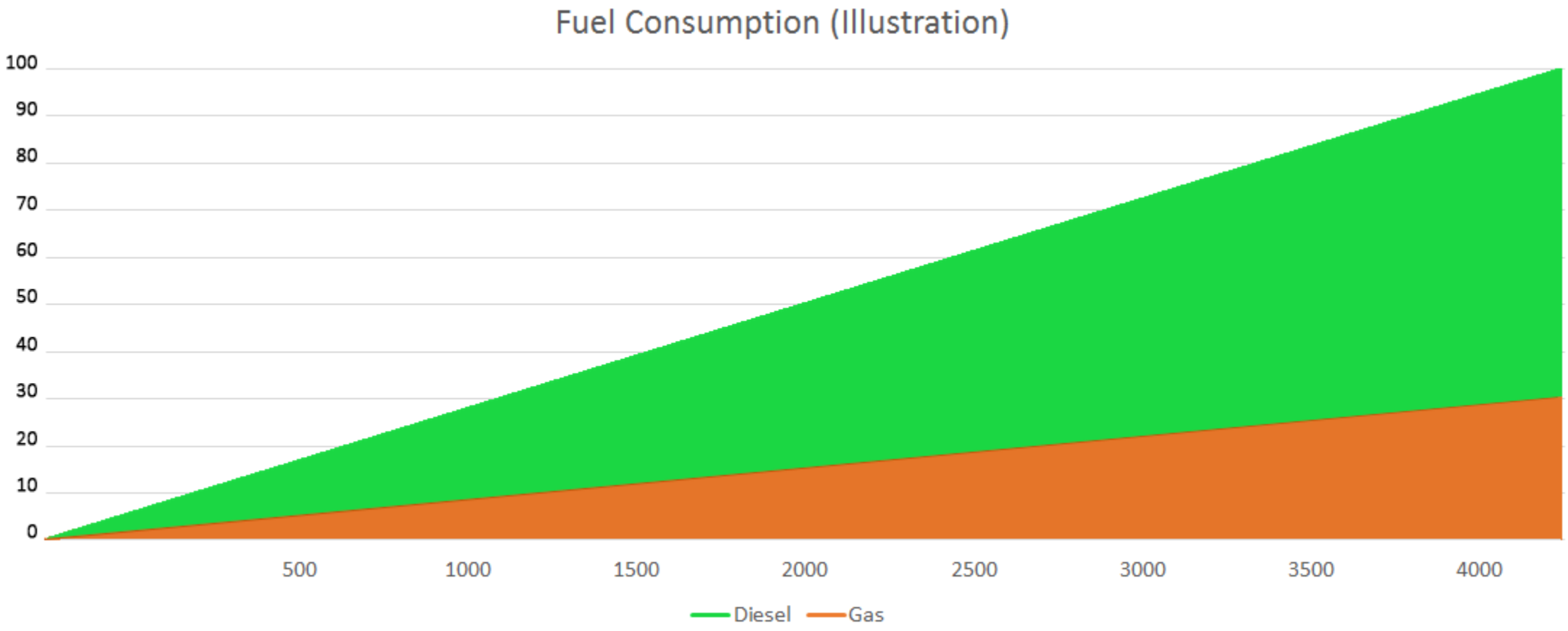
REV. 120101

Diesel Only


Fuel Consumption (Illustration)
100
90
80
70
60
50
40
30
20
10
0
500
1000
1500
2000
2500
3000
3500
4000
Diesel
Gas

Smart DDF System

Linear Substitution



DDF Conversion System Comparison

Typical Converter (Fumigation & Simple DDF)

1. Power dropped to 20%
2. Less efficient on both CNG & Diesel fuel economy
3. Lower Substitution Rate
4. Lower Fuel Cost Saving
5. Less Engine Protection Safety features
6. Longer installation down time
7. Knocking

Smart DDF Injection System

1. Power increases up to 30%
2. More efficient on both CNG & Diesel fuel economy.
3. Higher Substitution Rate. (Up to 80%)
4. Higher Fuel Cost Saving
5. More Engine Protection Safety features
6. Shorter installation Down Time
7. No Knocking Issue

Testing of Smart DDF Injection System at PTT CNG Research Center Thailand

Sample of allowed power increase

135 PS @ 3500 RPM

NEW PAJERO SPORT EXC

Rp. 420.000.000,00 On The Road

DIMENSION & WEIGHT

ENGINE TYPE

Type	2.5L DOHC Commonrail Turbocharged and Intercooled, 4 Cylinder In-line (4D56)
Displacement(cc)	2,477
Bore x Stroke(mm x mm)	91.1 x 95.0
Max. Output(PS/rmp)	136 / 3500 (100 kW)

Displacement(cc)

Bore x Stroke(mm x mm)

Max. Output(PS/rmp)

Max Torque(kgm/rpm)

Fuel System

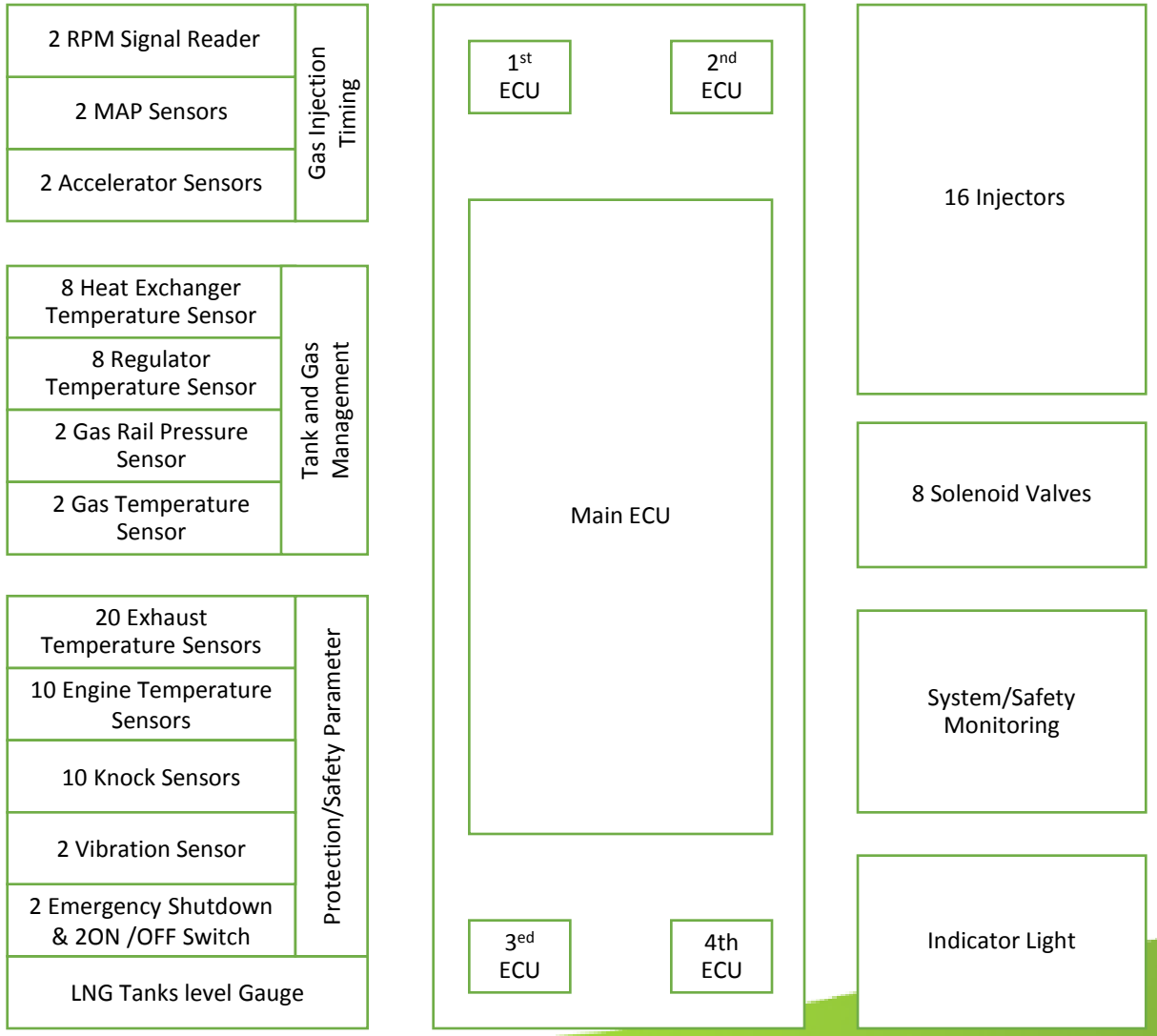
Fuel Type

Fuel Tank Capacity(litre)

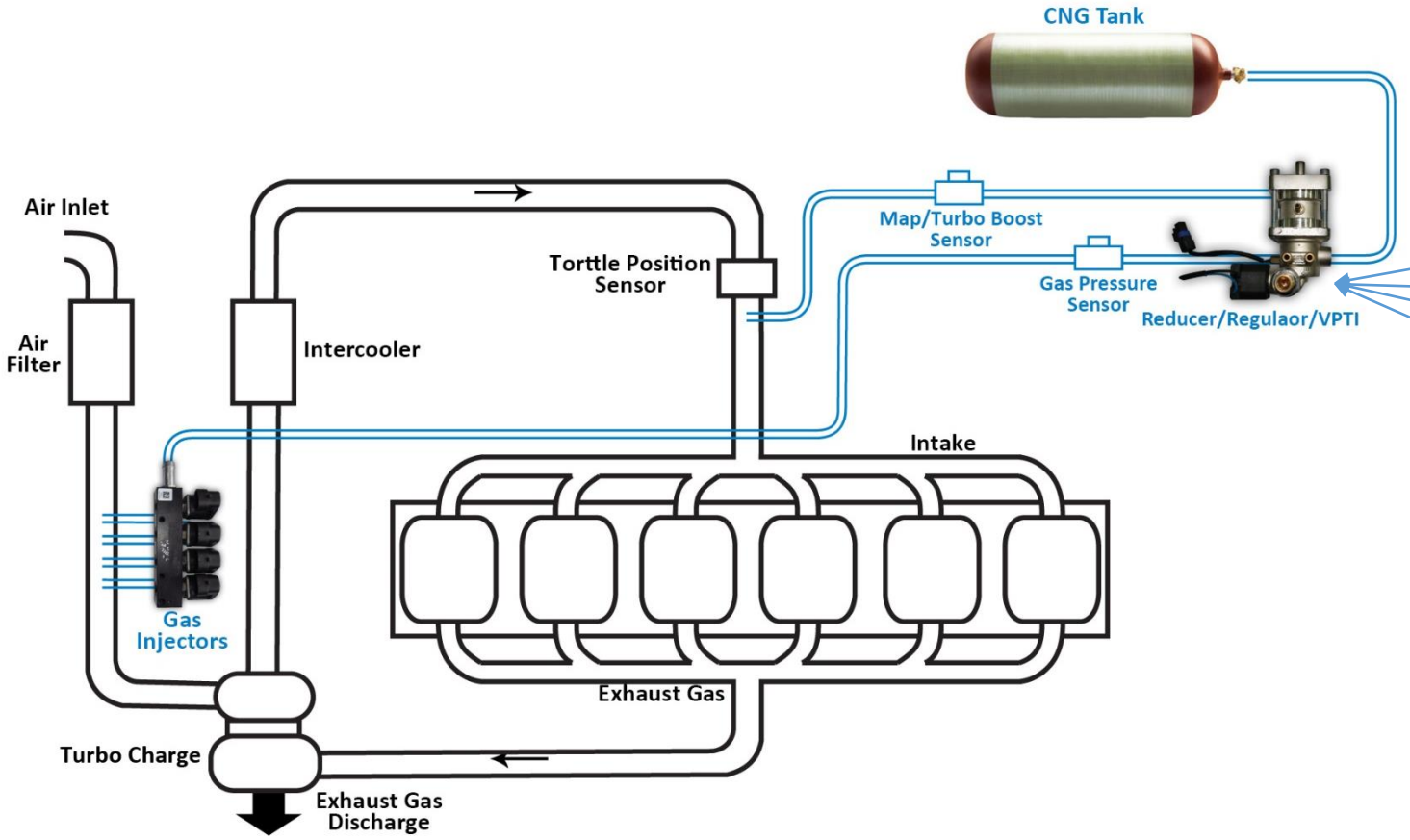
178 PS @ 4000 RPM

Type	2.5L DOHC Commonrail Turbocharged and Intercooled, 4 Cylinder In-line (4D56) (HIGH POWER)
Displacement(cc)	2,477
Bore x Stroke(mm x mm)	91,1 x 95,0
Max. Output(PS/rmp)	178/4000 (131 kW)

Smart DDF System



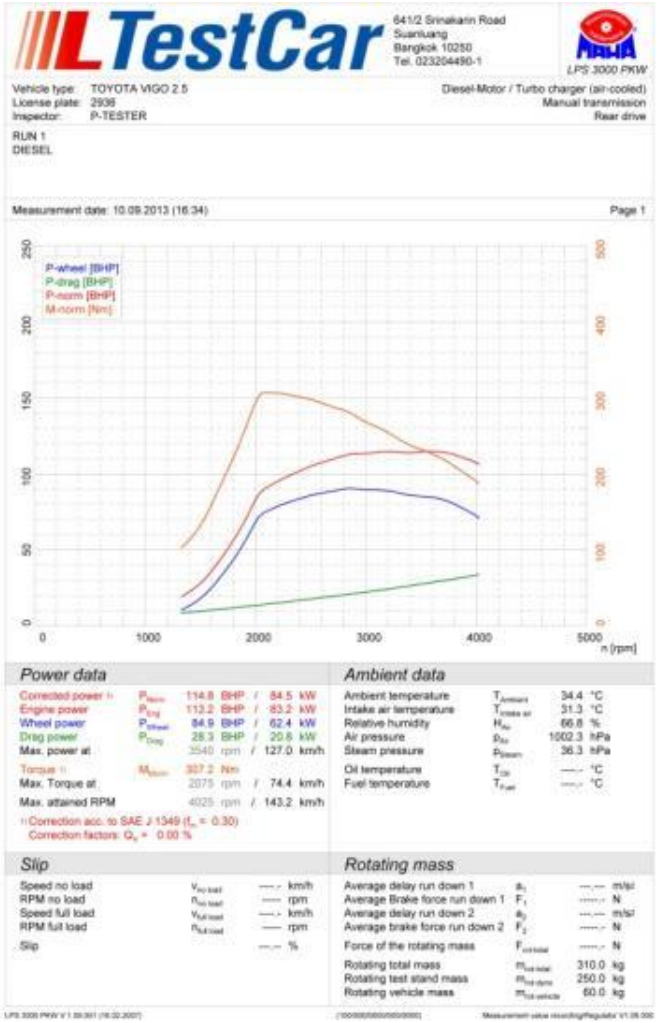
Mechanical Installation



Selenoid Valve
Pressure Gauge
Pressure Transducer
Pressure Control

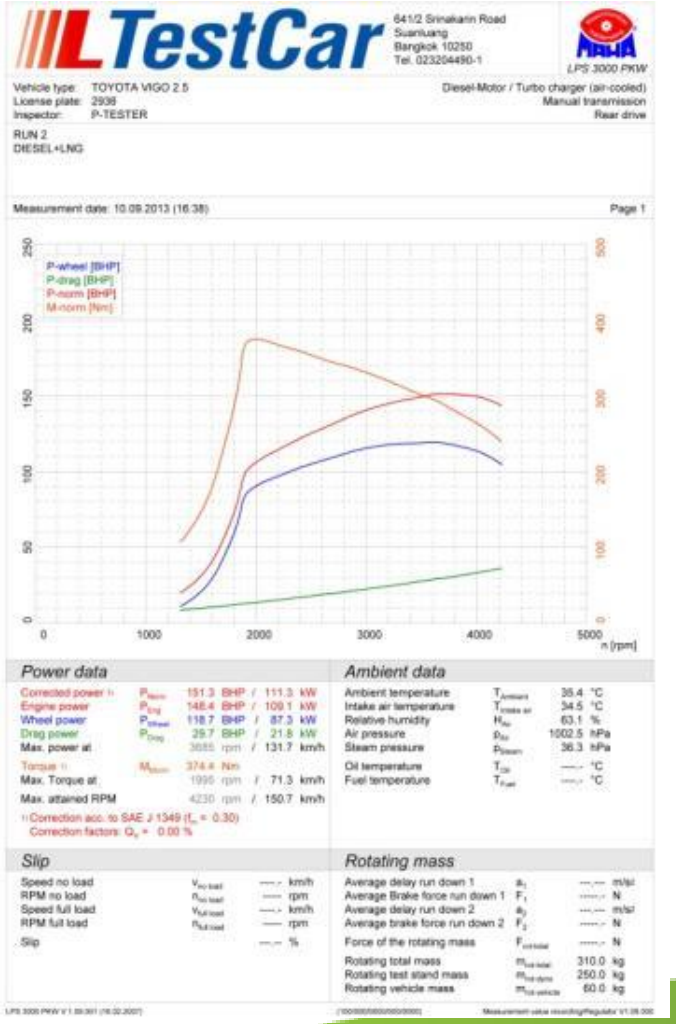
Test result

Diesel Only: 114.8 hp/84.4 KW



Torque 307 Nm/2075 Rpm

Diesel + LNG: 151.3hp/111.3 kw



Torque 374 Nm/1995 Rpm

UJI COBA JALUR LANGSUNG

Sabtu, 27 Sept 2014

Konsumsi Solar
TBBM -SPBU MTH - TBBM

Indikator Level Volume LNG
Saat Tiba di TBBM

2. **Jalur Langsung:**

TBBM – SPBU MT. Haryono (PP)

Jarak : 24 KM (PP)

Muatan : 32 KL

Konsumsi Solar : 2.08 lt

3. **Konsumsi Solar**

Total : 2.08 Lt

Rata – rata : <u>0.087 Lt/Km atau 11.54 KM/Lt</u>

Proses venting mengakibatkan banyak gas yang terbuang. Jumlah gas terbuang tersebut harus diperhatikan agar tidak mempengaruhi efisiensi yang telah diperoleh

SUMMARY

1. Pada tahap comissioning ini, diuji coba full solar Vs Mix Solar+LNG (dual) pada tujuan SPBU yang sama (apple to apple) agar didapat hasil uji coba yang akurat.

2. Berdasarkan hasil commisioning (uji coba dilakukan satu kali) diperoleh hasil :

   a. Dengan konsumsi bahan bakar full solar diperoleh hasil ratio ownuse real dilapangan sebesar 1 : 2,4 Km (sedangkan standard Pertamina untuk kapasitas mobil tangki 32 Kl ratio 1 : 2,5 Km)

   b. Dengan konsumsi bahan bakar Mix Solar+ LNG (Dual) diperoleh perbandingan pemakaian Solar Vs LNG yaitu :

      - Berdasarkan hasil uji coba real di lapangan, diperoleh hasil perbandingan pemakaian Solar 20,80 % dan LNG 79.20 %. Atau ratio konsumsi Solar 1 liter untuk 11,54 Km
      - Berdasarkan perhitungan ratio standard Pertmina untuk kapasitas mobil tangki 32 Kl, diperoleh hasil perbandingan pemakaian Solar 21,67 % dan LNG 78.33 %.

3. Untuk menghitung konsumsi Solar & LNG yang akurat untuk dijadikan acuan pedoman dalam operasi mobil tangki, diperlukan data yang cukup untuk dianalisa (minimal 30 data), maka akan dilakukan uji coba lanjutan selama 2 minggu untuk memperoleh nilai efisiensi yang tepat.

Teluk Lamong Sweeper

Dong Feng 190 Hp
Load: 24 tons. Subsitution: 69%

Owner: PT Indo Dongfeng Indonesia Year of conversion :2014

Hino Dump Truck Model FM260 TI (260 HP)
68,6% Substitution Rate with 37 tons Load

Owner: PT Sinarmas Indonesia. **Year of conversion: 2012**

Hino FM 260 Ti
DDF Substitution: 68,6%. 37 ton load)

100% Diesel 123,9 KM

124.1 KM after substitution:

Diesel Truck Converted to CNG DDF
Nissan UD Model PK 260CT (260 HP)
70% Substitution Owner : PT Utama Raya Transporindo. Surabaya

Faw DB 300 (300 HP)

70% Substitution

Owner : PT Utama Raya Transporindo. Jakarta. Year of conversion: 2013

This Nissan CWA 260

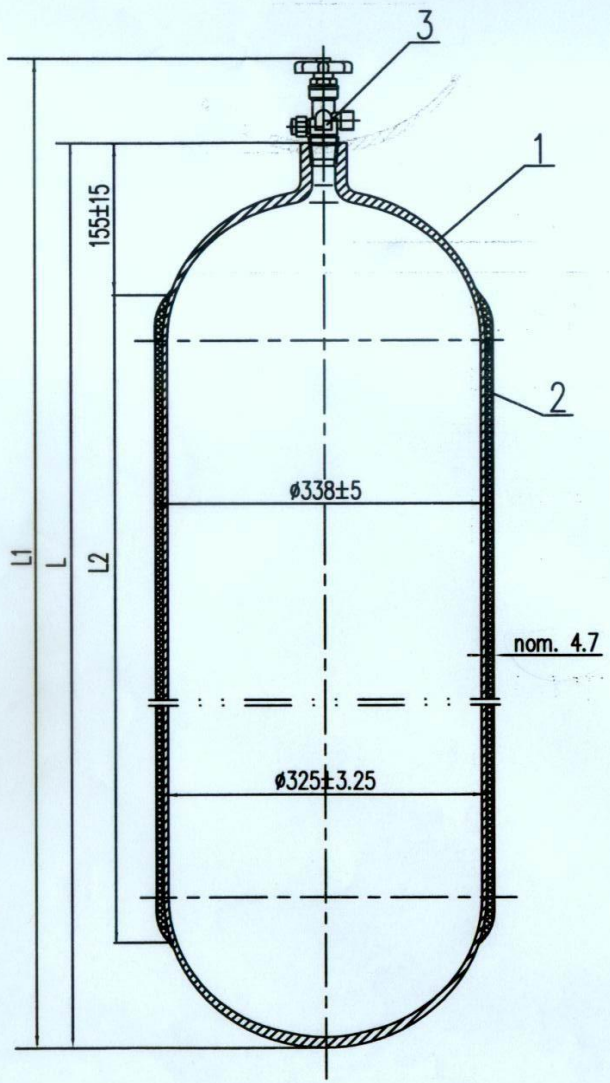
Achieve Substitution more than 70% by Smart DDF Injection System

Penambahan Tabung

1996 Nissan V10 Engine
CW 420 Heavy Duty Trailer to
CNG Diesel Dual fuel With 65% Subs

Owner : PT Escarada. Batam, Indonesia
Year of conversion 2011

Safety System



Technical Requirements

1. Application Standard: ISO11439:2000 CNG-2
2. Gas Temperature Range: -40℃ to 65℃
3. Filling Contents: Compressed Natural Gas
4. Composite Material: ECR-Glass Fiber, Epoxy Resin, MHHPA and BDMA.
5. Max. Working Pressure: 200 bar at 15℃.
6. The maximum filling pressure shall not exceed 260 bar, regardless of filling condition or temperature.
7. Hydraulic Test Pressure: 300 bar. Min. Auto-frettage Pressure: 330 bar
8. Min. Burst Pressure: 500 bar
9. The neck thread and the exterior protective coating shall comply with customer's requirements.
10. The service life is 15 years.
11. Specification of cylinder

Volumetric (Water) Capacity (L)	50	55	60	65	70	80	90	100	120
Ccylinder Length L (mm) ±20	830	865	925	990	1055	1185	1315	1445	1695
Total Length L1 (mm) ±20	900	935	995	1060	1125	1275	1385	1515	1765
Composite Material Length L2 (mm) ±20	550	585	645	710	775	905	1035	1165	1415
Tare Weight (kg) ±5%	45	48	51	54	57	63	70	77	89

12. Specification of valve

Type of valve	Max. working pressure (bar)	Working temperature (℃)	PRD activation temperature (℃)	Cylinder connection	Inlet connection
C351 (ROTAREX)	260	-40℃~+70℃	110℃±10℃	W28.8(DIN.477)	M12X1
IDRA200 (OMB)	260	-40℃~+85℃	108℃±6℃	W28.8(DIN.477)	M12X1

NO.	CODE NAME	NAME	QUANTITY	MATERIAL	ONE WEIGHT	TOTAL WEIGHT	REMARK
3		Valve					
2		Composite Material Layer	1				
1	CRP325-BV-01	325 Liner	1	30CrMo			

REV.	0		
NO	INDEX	SIGN	DATE
DESN	Zhang.Z.Y	REVD	
DRAN		APPD	
CHKD	Fu.Y.Qi		
		DATE	2005.12.22

ASSEMBLING DRAWING

TOTAL 2 PAGE

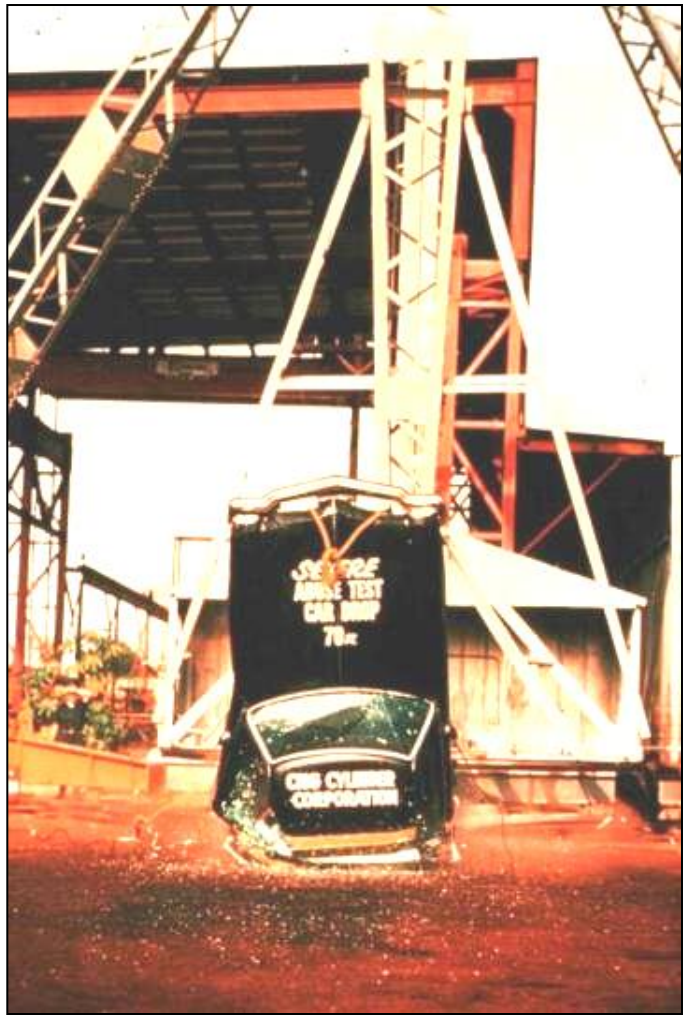
CRP325-BV-00

QUATITY	WEIGHT	SCALE

BEIJING TIANHAI INDUSTRY CO., LTD.

BUREAU VERITAS PARIS 1828 SHANG HAI REGISTRE INTERNATIONAL

Natural Gas For transportation Safety Tests



Cylinders in cars dropped from 10 m., 17 m., 25 m., and 30 m. and remained intact.

Safety Tests

Natural Gas Cylinder Safety tests

Shooting Test

Dinamite Test

PROVEN CNG SAFETY

CNG SAFETY

Thank You