

CHAPTER III

MATERIALS & METHODS

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I- Refinery Streams : were Kindly supplied by Cairo Petroleum Company-Mosrtord Refinery, including reformate, isomerate, light and heavy naphthas . Table 1 lists GC individual analysis and properties of these distillates as received from the producer .

II- Oxygenates : Methyl tertiary butyl ether (MTBE), 98.0 % (HPLC), ethyl tertiary butyl ether (ETBE), and tertiary amyl methyl ether (TAME), 98.2 and 98.7 (GC), respectively from Aldrich Chemical Co. Table 2 lists the physical properties of these oxygenates (Zogorski et al, 1997; Piel, 1989 a, b; Piel & Tomas, 1990) .

III- Gasoline Formulation : Four sets of gasoline blends were prepared volumetrically using combination of three neat refinery streams (reformate, isomerate, light and heavy naphthas) and one of the employed oxygenates . The formulated test bends, ten-liter each, were kept refrigerated (below 5 °c) in well-stoppered labeled containers . An ice-box used to keep these blends refrigerated when sent for octane number test and emission analysis . Gasoline blend designated RS (reference sample) is non-oxygenated, i.e. all-hydrocarbon which is used for comparison with the oxy-fuels . Formulations designated M-, E-, T-, blends consist of a number of refinery streams and MTBE, ETBE or TAME oxygenate, respectively .

IV- Test Methods and Equipment .

1- Specific Gravity Density-Capillary-Stoppered Pyknometer Method-IP 190 /64 .

2- Distillations Profiles-volatility Criteria-Driveability Index (DI)-ASTM-D 86 . Test Method for Distillation of Petroleum Products . ASTM-D 4814-98 a Standard Specification for Automotive Spark-Ignition Engine Fuel .

3- Hydrocarbon Types in Liquid Petroleum Products-Fluorescent Indicator Adsorption (FIA) Method IP 156 /65T .

4- Vapour Pressure-ASTM-D 323 Test Method for Vapour Pressure of Petroleum Product (Reid Method) . ASTM-D 4953 Test Method for Vapour Pressure of Gasoline-Oxygenate Blends (Dry Method) .

5- Gum content-ASTM-D 381 Test Method for Existent Gum in Fuels by Jet Evaporation Method .

6- Oxidation Stability-ASTM-D 525 Test Method for Oxidation Stability of Gasoline (Induction Period Method).

7- Sulphur Content-is determined by XRF using Oxford Lab-X300 Bench top Energy Dispersive X-Ray Fluorescence (EDXRF) Analyser . Oxford Instruments Industrial Analysis Group, USA .

8- Research & Motor Octane Numbers (RON& MON) are determined using Octane Analyser O.A. 228 Core Lab., Ser. No. 12837, USA .

9- Copper Strip Corrosion Test, 3Hrs., 50° C ASTM-D130 .

10- Exhaust Tailpipe Emission Analysis is carried out using Sun Gas Analyzer MGA 1200, faculty of Engineering-Mataria-Helwan University, Cairo, Egypt .

V- Test Vehicle :

The test vehicle was a Sahin car Type 1.4s, Model 2001, manufactured by El-Nasr Automotive Manufacturing Co., Wadi

Hoff, Helwan, Cairo, Egypt . The test vehicle has the following technical data :

Engine : 131 F1 0.16, No. 6628968- 4 Cylinders (in line)

Engine Capacity : 1400 c.c., Engine Location : front

Bore : 80.5 mm, Stroke : 67.4 mm

Compression Ratio : 8.3:1

Max. Power Out put : 78 HP at 5500 r.p.m.

Max. Torque : 10.7 kg.m at 3000 r.p.m.

Idle Speed : 900 ± 50 r.p.m.

Max Speed : 145 km/h .

VI- Vehicle / Engine Preparation and Emission Test :-

The test vehicle was prepared in strict accordance with the following requirements :

1- The test vehicle conducted 8000 km prior to testing on a 90 octane, low sulphur (< 100 ppm) gasoline, using the engine oil recommended by the manufacturer . A new air filter was installed and the fuel tank was fitted with a simple drain device to allow the tank to be completely emptied between a test fuel and another .

2- To allow comparable emission analysis for the examined oxyfuel, tailpipe exhaust gas probe was located in the same position for an extended period (5 minutes) prior to commencing each test (EPEFE, 1994) .