



شركة نفط البحرين (مغلقة)
THE BAHRAIN PETROLEUM COMPANY B.S.C. (CLOSED)

GCC Policy Development Meeting on Clean Fuels and Vehicles

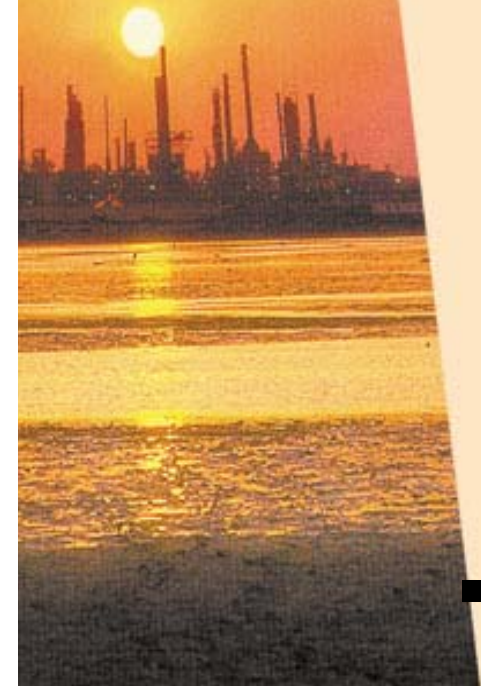
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Bapco Road Fuel Availability and Demand

Presented by
Essa G Al-Ansari
General Manager Engineering
Bahrain Petroleum Company B.S.C. (Closed)

Item of Discussion:

- Bapco Overview.
- Need for Change.
- Bapco's Strategic Investment Program (SIP).
- Gasoline.
 - Production.
 - Gasoline Future Issues
 - Quantity – meeting demand
 - Quality – Meeting Specifications
- Diesel
 - Production.
 - Diesel Specifications
 - Diesel Grade Availability
- Impact of clean fuel on environmental



Company Overview



- Bahrain Petroleum Company, BSC (Closed) - Bapco is engaged in oil and gas production, refining and marketing.
- Bapco Refinery is a medium conversion, middle distillate refinery with a rated capacity of 267,000 bpsd. Current configuration consist of the following key process units:
 - Five CDUs and VDUs – 267,000 bpsd
 - Fluid Catalytic Cracker – 43,000 bpsd
 - Diesel Hydrotreater(2HDU) – 70,000 bpsd
 - HVGO Hydrocracking(1HCU) – 40,000/60,000 bpsd
 - Visbreaker – 22,000 bpsd
 - Naphtha Unifiner/Platformer – 15,000 bpsd
 - Kerox Merox Unit



Need for Change

- Increasing world wide environmental awareness that has driven governments to introduce legislations requiring the use of cleaner automotive fuels.
- Bahrain Ministerial Order No.10 in 1999 (based on Amiri Decree No.21 with respect to the environment in 1996), which prescribed limits for emissions to air and discharges to water
- On the cleaner fuels issue Bapco carried out Feasibility Studies to investigate options for producing low sulphur diesel and unleaded gasoline.
- With regard to environmental compliance, Bapco carried out gap analysis and a compliance plan was agreed with the Environmental Affairs General Directorate. Specific projects were identified and were all included in Bapco's Strategic Investment Programme



Strategic Investment Programme (SIP)

What is it?

- The Strategic Investment Program is a defined number of investment projects totaling more than \$1.5 billion to be implemented in the period between 2000 and 2010.

Why do it?

- To modernize and upgrade the Bahrain Refinery to produce increased volumes of higher value products and meet anticipated future customers specification.
- To generate additional revenue and improve competitiveness
- To improve environmental compliance



Gasoline

Gasoline Production



- Bapco's main production is middle distillates (55%).
- Bapco gasoline production (7%) is mostly geared for domestic consumption.
- SIP's mandate was to convert to unleaded gasoline.
- Octane enhancement was achieved in 2000 by:
 - Reformer catalyst replacement from R50 to R56 – 98 RON at 12000 bpd.
 - Increase Reformer reactors' severity.
- In year 2000 Bapco gasoline went unleaded.

Bapco Platformer



Gasoline Future Issues

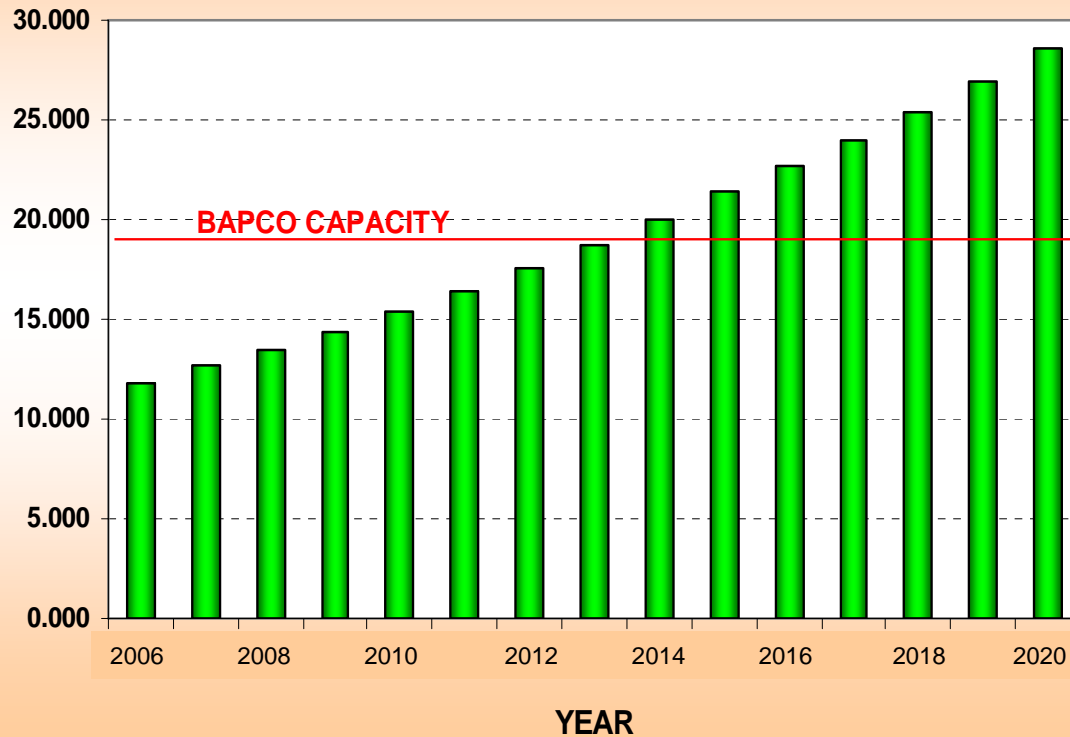


- Quantity – meeting demand
- Quality – meeting specifications.

Quantity - Forecast Local Gasoline Demand



Forecast Total Local Gasoline Requirement
2006-2020



YEAR	REQT. MBPD	DEFICIT, MBPD
2006	11.855	
2007	12.647	
2008	13.493	
2009	14.399	
2010	15.368	
2011	16.406	
2012	17.518	
2013	18.708	AT CAPACITY
2014	19.983	1.275
2015	21.348	2.640
2016	22.629	3.921
2017	23.987	5.279
2018	25.426	6.718
2019	26.951	8.243
2020	28.568	9.860

- Gasoline demand will reach production capacity by 2013, at the forecasted growth of 5.6% per year
- Deficit is minimal in 2014 (~ 1,200 bpd); and will become substantial only around 2020 (~ 9,800 bpd).

Quality – Meeting Specifications



GASOLINE SPECS	BAPCO B-395-UM	EURO III JAN 2000	EURO IV JAN 2005	EURO V JAN 2009
Aromatics, %v max	0	42	35	35
Benzens, %v max	3	1	1	1
Olefines, %v max	30	21-18	18	18
Sulphur, ppm max	150	150	50/10	10
RVP, kPa max	70 - 75	35 - 100	45 - 100	45 - 100
RON, min	95	95	95	95
MON, min	84	85	85	85

- Assuming Euro IV is the forecasted specification for the gasoline of the future.
- Bapco has no capability to meet Euro IV specs.



Quality – Meeting Specifications

- Bapco is capable of producing gasoline up to Euro III specifications.
- Changing to Euro IV specs or higher will require sizable investment. The most limiting specifications are aromatics benzene, olefins and sulphur.
- Bapco can invest only when clear direction on future local gasoline specifications is defined.
- Lead time for compliance (~5 years) should be provided if more stringent specs beyond Euro III are enforced.
- Investment needs to concurrently address the issues of Quantity & Quality.
- With the availability of unleaded gasoline, use of engines equipped with emission control devices should be encouraged.



Diesel



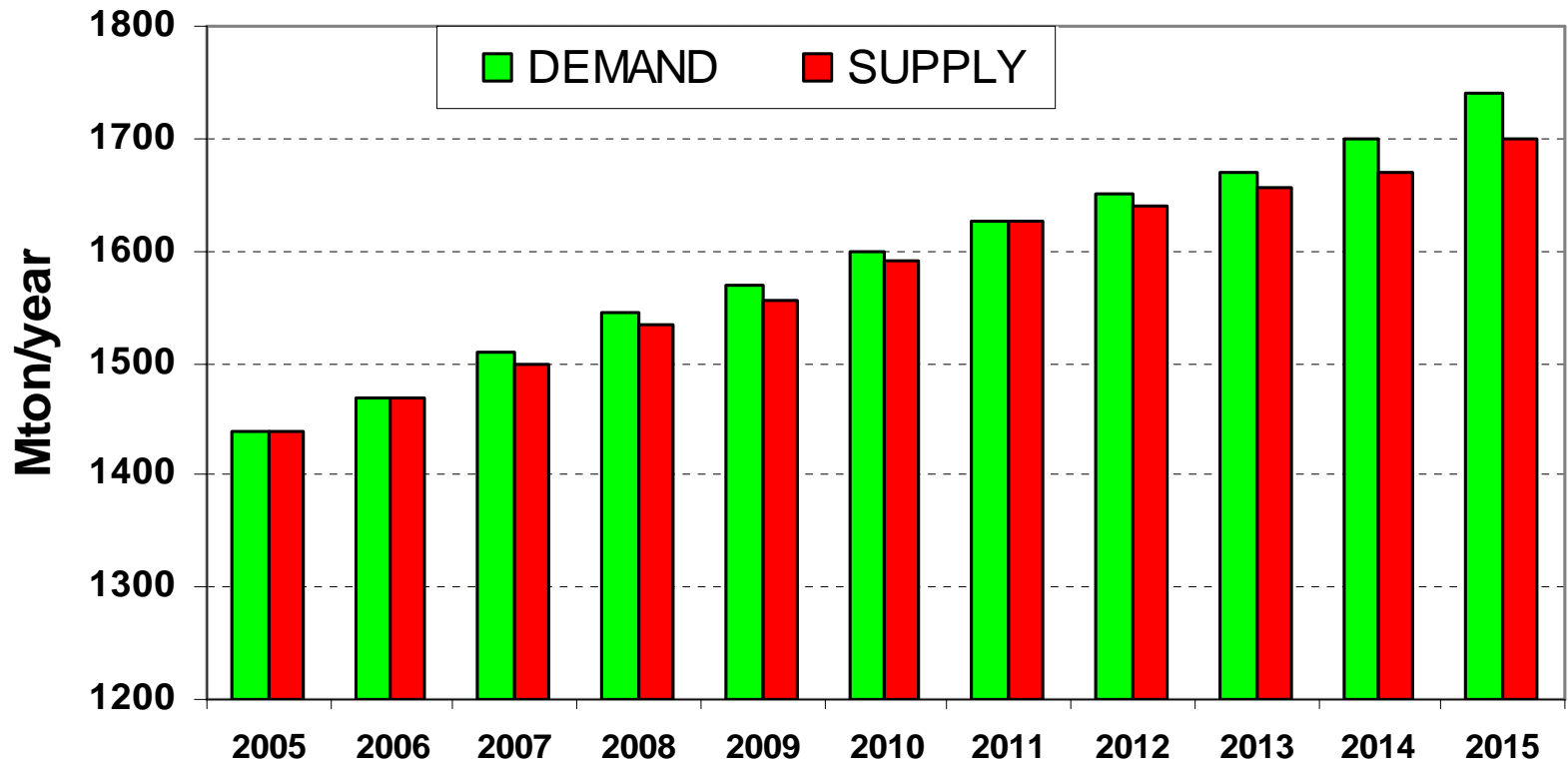
Diesel Production

- Bapco's diesel volume forms ~ 35% of the total production and is mostly geared for export marketing.
- Diesel specification worldwide was tightening.
 - Reduction in sulphur, aromatics, end-point, specific gravity.
 - Increase in cetane number.
- In 1996, India, a major market for Bapco diesel, decided to reduce sulphur limit from 10,000 ppm to 2500 ppm from 1999 and indicated further reductions.
- Bapco then average diesel sulphur pool was ~ 6500 ppmw.

Worldwide Mid Distillate Demand



Worldwide Middle Distillates Supply/Demand Balance



- Growth in diesel demand would be higher than that of gasoline.
- For the foreseeable future market demand would outstrip supply.



Diesel Production

- SIP's mandate was set to produce low sulphur diesel by implementing the Low Sulphur Diesel Production (LSDP) Project.
- LSDPP is a product yield and quality improving project with the primary objective of producing low sulphur diesel down to 10 wppm sulphur from then average of 6500 wppm.

Diesel Specifications



- Following configuration provided attractive economics and met objectives:
 - 60,000 bpsd HVGO Hydrocracker at 67% conversion – one of the largest in the world.
 - Revamp mild hydrocracker to a 70,000 bpsd diesel hydrotreater (10 ppmw S) - largest single train.
- Bapco positioned to meet the most stringent diesel specification
 - Polynuclear Aromatics (PNA): < 2 wt%
 - ASTM Distillation 95% Point: 340 deg C
 - Cetane Number: 55 – 56
 - Sulphur < 10 ppmw

**Low Sulphur Diesel Production Project
was successfully commissioned in 3rd quarter 2007**

**Bapco
Hydrocracking Complex**



Diesel Grade Availability



- What grades are Bapco producing?

Bapco can produce three grades of diesel, namely 2500 ppm, 500 ppm and 10 ppm based on the Market requirements.

- What diesel grades will be available in Bahrain?

Commencing in first quarter 2008, Bapco will be able to provide the local market with diesel with a sulphur content of 500 ppm, which is 90% lower than diesel sold currently (5000 ppm sulphur). Introduction of lower sulphur diesels need to be closely coordinated with the rest of GCC countries.



Diesel Fuel Sulphur Specification

Source: FACTS FALL 2007 DATA BOOK
Sulphur content in diesel fuel in ppm by weight.

	2007/2008	2010/2011	2012	2015
Kuwait	2000 ppm	2000 ppm		50 ppm
Oman	30-50 ppm	30-50 ppm		30-50 ppm
Qatar	500 ppm			
Saudi Arabia	1000-500 ppm	1000-500 ppm		
UAE	500 ppm	50 ppm	10 ppm	10 ppm



Impact of clean fuel on environmental

- **What are the environmental benefits?**

Reducing the sulphur content in diesel from 5000 ppm to 500 ppm will improve ambient air quality. The main advantages of introducing lower sulphur diesel fuel and unleaded cleaner gasoline in the local market, is to reduce the sulphur dioxide (SO₂) and particulate matter (PM) emissions as well as other pollutants, such as carbon monoxide (CO).
- However the full environmental benefits are only obtained when fuels and vehicles are treated as an integral system and vehicle engines are equipped with emission control devices, and when these are regularly inspected and maintained.



THANK YOU

Europe Gasoline Specifications for Qualities under Consideration



	Euro I&II	Euro III	Euro IV
	1 Jan, 1994	1 Jan, 2000	1 Jan, 2005
Aromatics, vol%, Max	---	42	35
Benzene, vol%, Max	5	1	1
Olefins, vol%, Max	---	21 & 18	18
RVP, kpa, Max	35 - 100	45 – 100 (2)	45 – 100 (2)
RON, Min	95 (1)	95 (1)	95 (1)
MON, Min	85 (1)	85 (1)	85 (1)
Sulfur, ppm, Max	500	150	50/10

(1) When regular grade is marketed, RON & MON shall be specified in a national annex but no lower than 81 MON & 91 RON

(2) Different RVP classes depending on climatic conditions. Euro III & Euro IV limits are 45 min – 60 max class A for summer period; 45 min – 70 max class B Arctic status for summer period. Transition periods may vary from 50 min – 100 max depending on volatility class



Bapco's Current Gasoline Key Specifications and Typicals

	B391UJ	B393	B395M	B395UM
Benzene SPEC Typical*	3.0% 0.7%		5.0% 1.2%	3.0% 1.6%
S% SPEC Typical*	0.15% 0.02%	0.20% 0.02%	0.10% 0.01%	0.15% 0.01%
Olefin SPEC Typical*				30% 27%
Aromatics SPEC Typical*				

* Typical represents the period Jul 04 – Jun 05

Quantity – Meeting Demand



- Gasoline demand will reach production capacity by 2013, at the forecasted growth of 5.6% per year
- Deficit will be small (~ 1,200 bpd in 2014; 9,800 in 2020)
- Available options : import gasoline or invest in new facilities to produce additional gasoline
- Investment to produce such a small quantity is uneconomical and illogical
- Deficit can be covered by importing gasoline or its blendstocks
- Shortfall can be covered by imports from the Arabian Gulf, Mediterranean or Asia Pacific
- Diesel usage in cars should also be encouraged to shift some of the local requirement to diesel
- We will invest only when volume of imports becomes difficult to handle and production becomes economically viable