Zero Fuel Oil Production

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By : Dr. Hasan Karam
Senior Vice President – Ruwais Refinery (East)
TAKREER’S REFINING CAPACITY

**Ruwais Refinery (East):**
Capacity: 420,000 bpd
Configuration: CDU, VDU, Hydrocracker, Mild Hydrocracker, Reformer, Isomerization, Base Oil.
Despatches: Jetty & pipelines

**Ruwais Refinery (West):**
Capacity: 417,000 bpd
Configuration: CDU, RFCC, Olefin Conversion Unit, Alkylation, mild Hydrocracker, Isomerization, Coker, Carbon Black.
Despatches: Jetty & pipelines

**Abu Dhabi Refinery:**
Capacity: 90,000 bpd
Configuration: CDU, Reformer.
Despatches: Pipelines
JOURNEY TOWARDS EXCELLENCE
TAKREER JOURNEY TOWARDS EXCELLENCE

- **Carbon Black & Delayed Coker**
- **RFCC & Base Oil Unit**
- **Petrochemicals Integration and Offshore Crude Processing**

**Value maximization by bottom of the barrel up gradation by commissioning Base Oil Unit & RFCC and entry into specialized products like Group II and III Base Oil, Polymer Grade Propylene, Alkylate, etc.**

- **Zero Fuel Oil** generation from the Refinery & Diversification into High valuable products like Anode Coke, Carbon Black while producing high valuable Propylene from Propane streams

**Increase Refining Margin through petrochemicals integration - Integrated Gasoline Aromatics Project** and shifting feed to more tougher, heavier, High Sulfur Offshore crude.

**Takreer operates world’s 4th LARGEST Refining Capacity in a given location at Ruwais**

**Beyond…** World Class diversified Refining complex

**To increase ADNOC’s international refined products market share**

**Value addition**

2010 2014 2016 2019 Beyond…
## TAKREER’S REFINING CAPACITY

### Refineries current capacity

<table>
<thead>
<tr>
<th></th>
<th>RR East 420 kbdp</th>
<th>RR West 417 kbdp</th>
<th>ADRD 90 kbdp</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPG</td>
<td>560</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Naphtha</td>
<td>5,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gasoline</td>
<td>2,600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jet Fuel</td>
<td>5,600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel</td>
<td>5,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Oil/Residue</td>
<td>1,100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pre-expansion Production (000’ tpa)

<table>
<thead>
<tr>
<th></th>
<th>Naphtha</th>
<th>Gasoline</th>
<th>Propylene</th>
<th>Jet Fuel</th>
<th>Diesel</th>
<th>Base Oil</th>
<th>Carbon Black</th>
<th>Anode Coke</th>
<th>Fuel Oil/Residue</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR East</td>
<td>560</td>
<td>2,600</td>
<td>1,600</td>
<td>5,600</td>
<td>5,500</td>
<td>600</td>
<td>40</td>
<td>430</td>
<td>1,100</td>
</tr>
<tr>
<td>RR West</td>
<td>5,500</td>
<td>2,600</td>
<td>1,600</td>
<td>5,600</td>
<td>5,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ADRD</td>
<td></td>
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### Post-expansion Production (000’ tpa)

<table>
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<tr>
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<th>Naphtha</th>
<th>Gasoline</th>
<th>Propylene</th>
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<th>Base Oil</th>
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<th>Anode Coke</th>
<th>Fuel Oil/Residue</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR East</td>
<td>10,000</td>
<td>5,600</td>
<td>1,600</td>
<td>10,000</td>
<td>11,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR West</td>
<td></td>
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</tbody>
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### Other Facilities:
- Power – 660 MW
- Desal Water – 14 MM Gallons/day
- Waste Treatment (BeAAT) – 26 KMT/year

**Refinery Expansion and Fuel Oil reduction resulted in increase of more than USD 10 billion per annum in Gross Product Worth**
BOTTOM OF THE BARREL UPGRADATION
BOTTOM OF THE BARREL STRATEGY – HEART OF REFINERY & PETROCHEMICAL INTEGRATION

RR (EXPANSION)
- Atmospheric Residue from RR (West)
- Vacuum Residue from RR (East)
- Coke Calciner
- Carbon Black unit
- DCU
- WCN
- WCNHT
- Slurry Oil
- To Mild Hydrocracker (For upgrading to Diesel)
- C3 from GASCO
- C3 from CBDC
- C3/C4
- C2-
- C2= Recovery
- Mixed C4=
- Olefin Conversion
- N butane & Iso butene
- C4 Feed Prep
- C3 Isom & Alkylation
- Alkylate
- C3=
- 2-Butene
- C3=
- C3=
- C2=
- C2=
- C3=
- C3=
- C3=

CB&DC
- Slurrry HT
- Carbon Black
- Distillate HT
- Coke Calciner
- PDH Unit
- Gasoline Blending
- Propylene
- Propane
- Carbon Black
- Distillate Blending
- Anode Coke

We Refine Right
BOTTOM OF THE BARREL STREAMS ARE CONVERTED TO HIGH VALUABLE PRODUCTS – Processes involved

**Base Oil Unit**

- Hydrocracking Unit
  - Unconverted Oil (UCO)
- Isodewaxing/Catalytic dewaxing
- Noble metal Hydro finishing
  - Base Oil

**Residual FCC (RFCC)**

- Crude Distillation Unit
  - Atmospheric Residue
- RFCC
  - Lighter products
  - LCO
  - Slurry Oil
- Mild Hydrocracker
  - Products

**Carbon Black & Delayed Coker**

- RR (East) Vac. Residue
- Slurry Oil
- Carbon Black
- Delayed Coker
  - Products
BLOCK FLOW DIAGRAM OF RFCC UNITS
BLOCK FLOW DIAGRAM OF CBDC UNITS

Slurry Oil from RR(West) 689 TPD

From Gasco 845 TPD
From Borous 100 TPD
From PRU 365 TPD
From Alky & SGP 301 TPD
DSO from RRD 86 TPD
LGO Ex CDU 1348 TPD

VR from RR 689 TPD
Slurry Oil from RR(West) 689 TPD

U2510-Slurry Hydro-Treater (AXENS) 8 kbpsd

U2600-Delayed Coker Gas Plant (8 kbpsd)

U2600-Delayed Coker Unit (Foster Wheeler) 29.5 kbpsd

U2650-LPG Treating Unit (UOP) 3 kbpsd

U2640-Propane Dehydrogenation Unit (UOP) 1845 TPD

U2520-Distillate Hydro-Treater (UOP) 23.5 kbpsd

U2530-Carbon Black Unit (Euro Technica) 2.5 kbpsd

U2620-Coke Calcination Unit (Technip) 2017 TPSD

U2900-SRU & TGTU 200 TPD

U2800-MDEA Regeneration Unit 308 m3/hr

U2810-MDEA Absorbers 19.6 knm3/hr

2300 Hydrogen Unit (Lurgi) 60 knm3/hr

Sour Off Gas

Rich DEA

Sour Off Gas

U2700 Sour Water Stripper Unit 3000 TPD

Stripped Water

U2800-MDEA Regeneration Unit 308 m3/hr

86 TPD Sulphur 91 TPD

U2900-SRU & TGTU 200 TPD

H2S 9 TPD

U2800-MDEA Regeneration Unit 308 m3/hr

H2S 82 TPD

Anode Grade Coke 1212 TPD

U2520-Distillate Hydro-Treater (UOP) 23.5 kbpsd

H2 51 TPD

H2 51 TPD

H2S 6 TPD

H2S 6 TPD

Coker Naphtha 750 TPD

LGO 1556 TPD

HGO 273 TPD

Green Coke 1426 TPD

H2 37 TPD

H2 85 TPD

To RRE

Sour Water

Stripped Water

H2S 9 TPD

H2S 9 TPD

U2900-SRU & TGTU 200 TPD

Anode Grade Coke 1212 TPD

H2 51 TPD

H2 51 TPD

H2S 6 TPD

H2S 6 TPD

Coker Naphtha 750 TPD

LGO 1556 TPD

HGO 273 TPD

Green Coke 1426 TPD

H2 37 TPD

H2 85 TPD

To RRE

Sour Water

Stripped Water

H2S 9 TPD

H2S 9 TPD

U2900-SRU & TGTU 200 TPD

Anode Grade Coke 1212 TPD
STATE OF ART PROCESSES AND SCALE
<table>
<thead>
<tr>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE OIL UNIT</td>
<td>Latest technology minimizing CAPEX &amp; OPEX, improve catalyst life, quality base oil, higher Viscosity Index, low pour point, higher yields, producing Grp. II and III base oil stocks</td>
</tr>
<tr>
<td>RFCC</td>
<td>World’s Largest unique Petroriser to boost Propylene Yield</td>
</tr>
<tr>
<td>SLURRY HYDROTREATER</td>
<td>First Licensed Unit in the world</td>
</tr>
<tr>
<td>CARBON BLACK</td>
<td>Produces N-220 (UV Grade) &amp; N-115 (Semi Conductive grade) carbon black</td>
</tr>
<tr>
<td>DELAYED COKER &amp; CALCINER</td>
<td>Converts low value VR from RR-E and Slurry Oil to High Value Anode Grade Calcined coke</td>
</tr>
<tr>
<td>PROPANE DEHYDROGENATION</td>
<td>Converts Propane from RRE, RRW, GASCO, BOROUGE to Polymer Grade Propylene</td>
</tr>
<tr>
<td>ARDS (POCP)</td>
<td>12 reactors to de-sulphurize Atmospheric Residue from Upper Zakum crude and feed to RFCC</td>
</tr>
</tbody>
</table>
CONCLUSION
Ruwais Refinery expansion project has helped ADNOC achieve its Strategic Objectives through:

• Value Maximization and improve profitability:
  • Reduction of Fuel Oil production
  • Production of quality feedstock for petrochemicals, Lube Oil & Coke

• Achieve improved performance & efficiency through optimal use of assets and natural resources – re-routing of heavier residues to upgrading units and processing of relatively distress crude oil in future

• Enhance technical knowhow of work force through use of state of art process & technology

• Contribute to Nation’s Development
Thank You