Bottom of the Barrel Upgrading Strategy in Takreer

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   *Bottom of Barrel Upgrading*

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Abu Dhabi National Oil Refining Company (Takreer)

- RR(E)
- RR(W)
- ADRD
- TRC
- HQ

Refineries

R&D
Mission & Objectives of TRC

Vision
- To become a leading Research Centre in the field of refining technology, process and product development

Mission
- To support and develop TAKREER core refining activities as well as assist in Technology Transfer and Human Resources Development in collaboration with local and international Institutes and Universities

Objectives
- To be a Technology Provider for Takreer refineries by supporting and developing Takreer core refining activities
- To assist in Technology Transfer and Human Resources Development in collaboration with other Institutes and Universities.

TRC

Refineries
- Petroleum Institute (PI)
  UAE University, Masdar Institute (MI),
  Borouge Innovation Centre,
  Future Upstream Research Centres
Ruwais – A tiny spot but a big player
Ruwais first refinery

Crude Oil

Condensate

**Ruwais Refinery East**

**420,000 BPSD**

- LPG
- Naphtha
- Gasoline
- Jet Fuel
- Gas Oil
- Fuel Oil/Residue

**GREEN DIESEL PLANT**

**Environmental/Quality Regulation Project**

**Produces Ultra Low Sulfur Gas oil with Sulfur content < 10 ppm**
Ruwais second refinery

CONFIGURATION OF RUWAIS REFINERY WEST

FEED

CRUDE OIL

PRODUCTS

CDU & Downstream Hydro-treating units

CDU capacity – 417000 BPD

LPG

Naphtha

Jet Fuel A-1

Ultra Low Sulfur Diesel

RFCC Block Units

RFCCU capacity – 127200 BPD

Polymer Grade Propylene

Unleaded Gasoline

Slurry to Storage

SRU & TGTU

Sulfur

Strategic integration with Borouge
BB East + BB West = Takreer Strategy

RR West
- LPG
- Naphtha
- Jet Fuel A-1
- Ultra Low Sulfur Diesel
- Polymer Grade Propylene
- Unleaded Gasoline
- RFCC Slurry

Product Sharing/ Blending

RR East
- LPG
- Naphtha
- Unleaded Gasoline
- Jet Fuel A-1
- Ultra Low Sulfur Diesel

CARBON BLACK & DELAYED COKER (CBDC)
- Naphtha
- Gas Oil
- Carbon Black
- Propylene
- Anode Grade Coke

Vacuum Residue
Carbon Black & Delayed Coker Project

Bottom of Barrel Upgradation to derive the Best from the Worst
**MAIN OBJECTIVE**

- Upgrading Bottom of barrel such as RFCC slurry and Vacuum Residue
- Minimize Fuel Oil Production
- Production of value added products like Carbon Black, Propylene and Anode Grade Coke

**FACILITIES PLANNED**

- Slurry Hydro Treater
- Carbon Black Unit – Delayed Coker Unit
- Distillate Hydro Treater
- Hydrogen Unit
- Propane Dehydrogenation Unit
- Coke Calcination Unit
- LPG Treatment Unit
- Associated open-art units, off-sites and utilities.
- Integration of above with RR(E), RR (W) & other OPCO’s
BOTTOM OF THE BARREL UPGRADING UNITS IN RR-EXPANSION INCLUDING CBDC

- RFCC
- PDH
- Slurry Hydro Treater
- Delayed Coker
- Carbon Black

- Produces N 220 (UV grade) & N 115 (Semi conductive) Carbon Black
  - Produces Green Anode grade coke
- First Licensed unit for hydrotreating slurry in the world
- Produces high value propylene
- World's largest with unique Petro-riser to boost C3= yield
WHY DO WE EXPAND OUR FACILITIES??
EXPANSION PROJECTS IN RUWAIS REFINERY – MAIN OBJECTIVE

- Increase in ADNOC’s Refined Product share
- Bottom of Barrel Upgrading (CBDC)
- RR Expansion Project (RR-West)
- Environmental & Quality Specifications
  - Meeting stringent product quality leading to harmful emission reduction
- Integrity & Diversity
  - Production of high value products like Propylene, Carbon Black & Anode grade Coke

OPCO’s

STRATEGIC INTEGRATION
CURRENT / FUTURE CAPACITIES & PRODUCTION PATTERN
TAKREER’s CURRENT REFINING CAPACITY

- **RR (E)**
  - 420,000 Barrels/day

- **ADRD**
  - 90,000 Barrels/day

- **Other Facilities**
  - Power – 660 MW
  - Water – 14 MM Gallons/day
  - Waste Treatment (BeAAT) – 26 KMT/year
CURRENT REFINERY PRODUCTION

Takreer Refineries

Day

Barrel / Day

230,000

Condensate

280,000

Barrel / Day

510,000

Barrel / Day

Crude Oil

LPG

560

Feedstock for Petrochemical Industry

Naphtha

5,500

Products Used in Transportation

Gasoline

2,600

Jet Fuel

5,600

Bunker Fuel / Feedstock for Manufacturing Plants

Diesel

5,500

Fuel Oil/Residue

1,100

5.3%
CAPACITY AUGMENTATION POST EXPANSION

Expected Capacity Augmentation by 82% after Ruwais Refinery Expansion

ONE OF WORLD’S LARGEST REFINERIES

<table>
<thead>
<tr>
<th>Capacity, BPSD</th>
<th>Current</th>
<th>Future</th>
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<tbody>
<tr>
<td>Capacity, BPSD</td>
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<td>930000</td>
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EXPECTED PRODUCTION AFTER EXPANSION (RRE & CBDC)

<table>
<thead>
<tr>
<th>Product</th>
<th>Thousand Ton / Year</th>
<th>Increase %</th>
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</thead>
<tbody>
<tr>
<td>Naphtha</td>
<td>10,000</td>
<td>81%</td>
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<tr>
<td>Gasoline</td>
<td>5,600</td>
<td>115%</td>
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<tr>
<td>Propylene</td>
<td>1,600</td>
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<tr>
<td>Jet Fuel</td>
<td>10,000</td>
<td>78%</td>
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<tr>
<td>Diesel</td>
<td>11,000</td>
<td>100%</td>
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<tr>
<td>Base Oil</td>
<td>600</td>
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</tr>
<tr>
<td>Carbon Black</td>
<td>40</td>
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<tr>
<td>Coke</td>
<td>430</td>
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<tr>
<td>Fuel Oil/Residue</td>
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</tr>
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</table>

Takreer Refineries

Crude Oil
- 650,000 Barrel / Day

Condensate
- 280,000 Barrel / Day

930,000 Barrel / Day

Efficient Bottom of barrel technology
CONFIGURATION OF UPCOMING CBDC PROJECT

From New Refinery [RRE]
- RFCC Slurry 8.0 kbd/510 ktpa

From Existing Refinery [RRD]
- Vacuum Residue 25 kbd/1350 ktpa

Slurry HDT (Axens)

Carbon Black to Borouge
- 27 ktpa - N220 UV Grade
- 13 ktpa - N115 Semi-Conductive
- 40 ktpa - Total

Carbon Black Eurotechnia

Propene 500 ktpa

Propane Dehydro-Genation (UOP)
- Naphtha 90 ktpa
- HDT Gas Oil 530 ktpa
- Hy.Coker Gas Oil 100 ktpa
- Calcined Coke 430 ktpa

Propane 560 ktpa

From RRE, GASCO & Borouge

Merox (UOP)
- LPG 500 ktpa
- Naphtha Lt. Gas Oil 370 ktpa

Delayed Coker (Foster Wheeler)
- HDT Slurry

Coker Distillate HDT (UOP)

Calciner (Technip)
- Anode Grade Green Coke 530 ktpa
- Carbon Black 430 ktpa
CONCLUSION
Current Slate

- LPG: 3%
- Naphtha: 26%
- Gasoline: 13%
- Jet Fuel: 27%
- Diesel: 26%
- Fuel Oil/Residue: 5%

Future Slate

- Fuel Oil/Residue: 0%
- Naphtha: 26%
- Gasoline: 14%
- Jet Fuel: 25%
- Diesel: 28%
- Propylene: 4%
- Base Oil: 2%
- Coke: 4%
- Carbon Black: 0.2%
Thank You