

Oil and Gas Processing

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Opportunities & challenges



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Azzawia Refinery

- ▶ Two topping units with a capacity of 120 KBL/day
- ▶ Hydro skimming fuel refinery
- ▶ Produces LPG/SRN/Gasoline/Jet Kero/ diesel/fuel oil
- ▶ Up to 50% of the production is fuel oil (**Opportunity**)
- ▶ Not all the SR Naphtha produced is converted into Gasoline (**Opportunity**)
- ▶ Flexible crude supply by pipeline and by sea
- ▶ Connected to two product distribution depots
- ▶ Connected by pipeline to the nearby Elharsha power Plant
- ▶ Connected to West Tripoli power station with a fuel oil line
- ▶ Connected by pipeline to Elwatia airbase
- ▶ Close to a big local demand area in the Western part of the country



Ras lannuf Refinery

- ▶ A Topping Refinery with a capacity of 220KBL/Day
- ▶ Produces LPG/SRN/Jet kero/ diesel/ fuel oil
- ▶ No Gasoline production (**Opportunity**)
- ▶ Up to 50%of production is fuel oil (**Opportunity**)
- ▶ A petrochemical refinery producing SRN to feed the steam cracker(Ethylene Plant)
- ▶ Connected to Mesla/ Sarir crudes by pipeline and dedicated storage tanks
- ▶ Modern closed port facilities to export refinery and cryogenic products
- ▶ Connected by road to Benghazi and Tripoli
- ▶ Own power plant, sea water intake and desalination plants
- ▶ Modern Township with five neighborhoods . Only three are constructed (**Opportunity**)
- ▶ The refinery can be connected to a depo to distribute products to the local market(**Opportunity**)







Tobruk Refinery

- ▶ A small refinery located in Mersa Elheraga terminal with a capacity of 20KB/day
- ▶ The refinery produces LPG/ SRN/ jet kero / diesel / Fuel oil and no gasoline production (**Opportunity**)
- ▶ Up to 50% of the production is fuel oil
- ▶ The refinery has a secure crude supply from Sarir crude oil (**Opportunity**)
- ▶ Some of the products are marketed locally and the rest is exported.
- ▶ Close to a big local market for fuel products



Mersa Elbrega Refinery

- ▶ A small refinery located in Mersa Elbrega with a capacity of 10Kbl/day of Brega Crude
- ▶ The refinery produces LPG/ Gasoline/ Jet kero / diesel and Fuel oil
- ▶ Up to 50% of the production is fuel oil
- ▶ The refinery is connected to a small depo for distribution of products to the local market
- ▶ The oldest refinery in Libya.



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Elsarir Refinery

- ▶ A small refinery of 10KBL/day located in Sarir oil field.
- ▶ The refinery produces LPG/ Gasoline / Jet Kero /Diesel/ fuel oil
- ▶ Land locked and the products are distributed locally directly from the refinery
- ▶ The refinery uses Sarir crude as a feedstock
- ▶ The fuel oil produced is injected in the crude oil pipeline to Tobruk



Petrochemicals



Ethylene Plant

- ▶ Naphtha based steam cracker
- ▶ Stone & Webster process design technology.
- ▶ Produces 330KT/year ethylene, 171 KT/year Propylene, 132 KT per year of mixed C4's, 325KT/year RPG and 43 KT of Pyrolysis fuel oil(**Opportunity**)
- ▶ Part of the ethylene is polymerized locally and the rest is exported to Abukamash and to the international markets
- ▶ Part of the RPG is blended into the gasoline pool in Azzawia refinery



Polyethylene plant

- ▶ Two lines with a capacity of 80 KT each of polyethylene
- ▶ American technology based on Union Carbide U350 Reactors
- ▶ Part of the polyethylene is marketed locally to plastic producers from the private sector and the rest is exported
- ▶ The plants are capable of producing many grades as per the market requirements
- ▶ A bagging system is part of the plant





OIL Chemicals



Methanol Plants

- ▶ Two Methanol (CH_3OH) plants with a capacity of 1000T/day each
- ▶ The plants are based on pipeline gas from Hatiba Field.
- ▶ All production is exported to the international market
- ▶ With more than 110 million tons produced annually in over 90 Plants, It is a business worth over 30 BL dollars
- ▶ It is mainly used as a precursor to other commodity chemicals, including formaldehyde, acetic acid, methyl tert-butyl ether, methyl benzoate, anisole, peroxyacids, as well as a host of more specialised chemicals(**Opportunity**)



Ammonia plants

- ▶ Two ammonia(NH_3) plants producing up to 2500 /day of ammonia
- ▶ Ammonia is based on natural gas as a feed stock
- ▶ Ammonia is used mainly as a feed stock to the adjacent urea plants
- ▶ Around 180 million tones are produced annually with a market value of around 70 billion dollars world wide
- ▶ Around 70% of ammonia is used to make fertilisers in various forms and composition, such as urea and Diammonium phosphate. As such, its importance can hardly be overstated in contributing to the food security worldwide. (Opportunity)
- ▶ Ammonia, either directly or indirectly, is also a building block for the synthesis of many pharmaceutical products and is used in many commercial cleaning products. (Opportunity)



Urea Plants

- ▶ Two urea plants $\{\text{CO}(\text{NH}_2)_2\}$ with a capacity of up to 2500 T/day of Urea
- ▶ Urea is produced using ammonia as feedstock
- ▶ Some of the Urea produced is bagged and sold to the local market including agriculture projects, farmers corporations and private sector
- ▶ The rest is sold to the international market as bulk Urea. (Opportunity)
- ▶ Worldwide production of 170 million tons per year with a market value of around 50 billion dollars
- ▶ More than 90% of world industrial production of urea is destined for use as a nitrogen-release fertilizer







LNG Plant

- ▶ A 120K bl/day LNG plant in Mersa Elbrega
- ▶ It produces LNG which is exported to Spain.
- ▶ LNG is vaporized and injected into gas pipelines networks feeding consumers
- ▶ In the years prior to 2011 the plant was running at low capacity of around 20Kbl/day due to shortage of gas feed.
- ▶ Currently the LNG plant is shutdown due to lack of Gas
- ▶ There was an attempt to upgrade the plant and restore it to its original capacity with Shell but the project failed to extremely high cost and the lack of commercial gas discoveries by Shell



Condensates

- ▶ Over all production of condensates is in the range of 54 bbl/day according to current NOC daily production reports
- ▶ This condensate can easy be converted into gasoline(Opportunity)
- ▶ The major quantity is produced in Melita, Brega and Zuitena
- ▶ During the planning of Melita, not much attention was given to the local market requirements
- ▶ A study is ready with Melita to covert the condensates into gasoline.

Asphalt Plants

- ▶ Two Asphalt plants, one in Azzawia and the other is in Benghazi
- ▶ The capacity of the two plants is 200KT/year
- ▶ The plants are based on reduced crude that is imported from the international market
- ▶ All production is used locally for the base core of roads



Lube oil Plant

- ▶ Only one lube oil plant is located in Azzwaia Refinery and it is not covering local market needs
- ▶ The plant is based on base oil imported from the international market
- ▶ Production lines of 1 liter, 4 liter and 200 liter of international specification engine oils
- ▶ There is strong competition with ready oils imported from the international market
- ▶ There are plans to upgrade the lube oil plant and increase its capacity from 100KT/year to 200 KT/year (**Opportunity**)
- ▶ Also there are plans to build a new lube oil plant in Benghazi adjacent to Benghazi asphalt plant(**Opportunity**)



Structure & Governance

- ▶ 100% NOC owned companies
- ▶ Azawia is covered by a crude oil processing fee for every barrel processed in the refinery
- ▶ Ras lanuf is covered by approved budget and a monthly cash call arrangements covering cost approved budget
- ▶ Mersal Elbrega is part of SOC which in turn is covered by an approved budget and cash call arrangements
- ▶ Yara JV has been cancelled and the Libyan Fertilizer company is now running the two ammonia and two urea plants. Back to budget and cash call arrangements
- ▶ LIRCO JV is in litigation and previous NOC management decided to cancel the JV
- ▶ The board of NOC is the General assembly of the companies
- ▶ Two Technical meetings are held each year to facilitate follow-up and budget approval process

Exploring new Ideas

- NOC board and a General Manager for the first time.
- Renegotiating all EPSA and transferring the old concession agreements into EPSA
- Renaming of all JV operating companies.
- Merging Agip oil and Melita Gas into one company , Melita OIL & Gas with two divisions
- Assigning contract area 100 and contract area 101 to AGOCO and Sirte oil companies
- A transparent exploration round
- International investments in the down stream industry, Ras Lanuf Refinery & Ammonia and Urea
- Lifting Monopoly on the distribution of oil products in the Libyan market (private companies)
- Closing down of the procurement offices in London and Dusseldorf
- A failed attempt to dispose of and sell Oil Invest in Europe
- Transfer of the oil sector Engineering Company from London to Tripoli
- Changed ARC to a profit and loss center instead of a cost center.
- Production reached 1.810 million barrels per day a few days during February 2011.

OPPORTUNITIES

- Availability of two major feedstock ; oil and gas
- Availability of oil products(fuel oil, Surplus Naphtha, Condensate, propylene, mixed C4,Methanol, Urea ,Ammonia , and RPG
- Hydro skimming refineries, opportunity to produce more valuable products and improve economics
- A great opportunity to produce much needed fuels such as gasoline and diesel
- Young Manpower and available training centers
- Availability of oil ports to export and import products
- Availability of a national gas pipeline extending from Melita to North Benghazi for energy and as feedstock
- Closeness to European and African Markets Market
- Creation of jobs

Challenges

- ▶ NO Political will and no clear vision and strategy on maximizing the returns on oil barrels and gas SCFs
- ▶ NO political stability and no security
- ▶ Poor infrastructure to attract international partners
- ▶ The downstream is not covered in the Petroleum law
- ▶ No enthusiasm from NOC top management to make big steps in oil processing
- ▶ Not enough gas is fully developed and can be used
- ▶ High capital investments is required and competition with the upstream industry on resources
- ▶ Technology
- ▶ Limited experience on down stream Joint ventures with international players

Conclusions

- ▶ A clear political will on the highest level is needed to lead aggressive development of the downstream sector
- ▶ The oil processing sector of NOC is stagnant and no major developments for the last 30 years
- ▶ There are clear opportunities to develop this sector for adding value and better returns ,creating jobs and satisfying the local market of much needed products
- ▶ High investments are required and a clear way of securing these investments is urgently required
- ▶ Different ways of financing down stream projects need to be explored and agreed upon.
- ▶ No technology restrictions are currently applicable on the downstream sector in general
- ▶ A gas master plan is needs to be developed in order to optimize gas utilization