November, 2017 - Issue, 01

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Kuwait National Petroleum Company

KNPC TECH

A Biannual Magazine

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KNPC TECH, is a biannual magazine, issued by the Corporate Communication Department to publish the work papers, researches and articles prepared by KNPC staff. The magazine is mainly concerned in the technical aspects of refining industry and other KNPC businesses.

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THE FULL VERSION OF ALL ARTICLES CAN BE VIEWED THROUGH THE FOLLOWING LINK: http://ewataniya.knpc.com

KHULOUD SAAD AL-MUTAIRI
CCD Manager

EDITOR'S NOTE

KNPC TECH is the latest addition to the family of Corporate Communication Department publications. Our intent is to fill the gap in publishing the special works of KNPC staff. We target the numerous research and work papers given by our employees at various international and local conferences. We want to shed light, document and to make those efforts a valuable reference for the technical experience of KNPC staff.

All KNPC employees are invited to be part of the magazine, and anyone who has the writing merit is most welcome. Studies, market analysis, management, human resources, IT, local/international oil market analysis, certain units of the refinery, refining technologies, oil-related aspects/studies, etc..., all have a place in the new magazine.

Articles shall be published in the name and photo of the writer. This will make a worthy addition to the personal CV.

We are proud of KNPC expertise, and believe "KNPC TECH" will be an excellent platform to display our employees' proficiency.

MOHAMMAD GHAZI AL-MUTAIRI
Chief Executive Officer

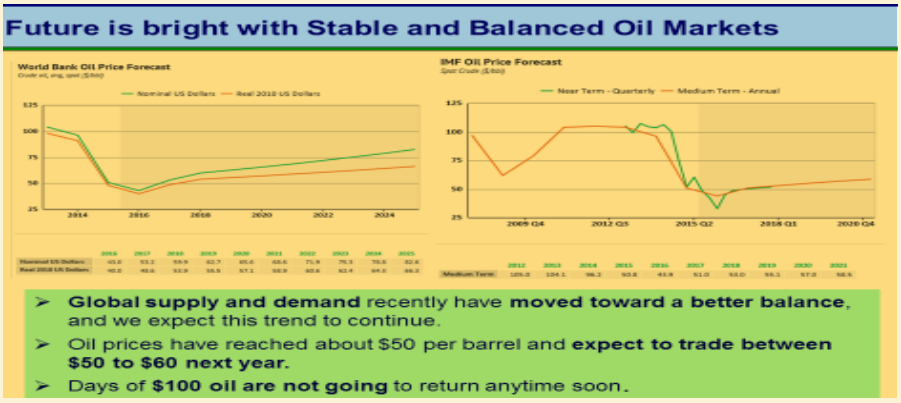
"Achieving Growth in Challenging Times"

The history of Japan/Kuwait Relationship on trade started with Japanese ships entering the Gulf port to Kuwait in 1913, and trades started in 1916. But the first steadfast relationship with Kuwait started when Kuwait and Japan signed in 1958 the contract for the reconnaissance of some oil field for the Japanese Arabic Oil Limited.

Let me now talk about the main topic:

"Achieving Growth in Challenging Times"

You may remember the higher oil prices during the period 2010 – 2014, followed by unexpected fall in oil prices which have started new realities in the markets, where plans and strategies are closely revisited. The main features of the new order are (1) lower oil revenues, (2) significant reduction of investments.



This environment compelled the industry to overcome the challenges for sustainable operations and future growth. All GCC countries announced sizeable gasoline price rise.

I will share with you some of the strategies that we have undertaken to achieve growth in uncertain world, which include lifting subsidies for retail prices as well as electricity. From 1st September, 2016, the price of low octane petrol increased by 41 percent, while high-grade petrol increased by 61 percent. Diesel and Kerosene prices were also rationalized in January 2015 to reduce the subsidies. Subsidy for electricity will also be lifted marginally.

KNPC plays a vital role in meeting Kuwait energy demand, which is expected to grow significantly for power generation by around 6% annually. Demand for electricity more than doubled between 2003 and 2013.

Kuwait has one of the highest energy consumption rates per capita in the world. This is a result of a combination of factors, such as extreme weather conditions, government subsidies, growing population and energy intensive water desalination plants.

KNPC profitability remains under pressure due to weak prices and tight refining margin. We have implemented a rigorous program called COPI (Cost Optimization and Profit Improvement) to optimize the costs, identify and implement profit improvement opportunities.

We continue to focus on the strategic priorities related to safety, operational reliability, financial/operational performance, stakeholders management, human capital and future growth plans.

During 2015-16, a total of about 130 million dollars were saved.

Costs Optimization & Profits Improvements (COPI)

- **Weak Oil Prices pose a challenge to the downstream business.**
- **Costs Optimization & Profits Improvement - Main strategy to overcome challenges**
- **To ensure it is fully activated, High level of Steering is dedicated to supervise**
- **This program has been an added value for the refining activity.**
- **We keep Close monitoring to the process to ensure productivity & achieving the set goals.**
- **We plan to share success within oil sector.**

In accordance with KPC's long-term strategic plan, KNPC has embarked on ambitious program to execute mega projects with an investment of around 40 Billion US$.

In the last two years, KNPC awarded and commenced EPC of four mega projects i.e. CFP, Al-Zour Refinery, LNG Import Facilities and 5th Gas Train in addition to various other ongoing critical and operational projects. We target 2020 to be the year when most of these projects will be commissioned.

Clean Fuels Project, is to upgrade the existing refineries into an integrated refining complex to meet the future diversified market requirements while maintaining high safety and environmental standards.

Kuwait crude refining capacity will be 1.4 million bpd by 2020, 51% increase from current capacity. This would enhance the refining complexity and improve refining margins.

We are exploring new means for financing future strategic projects to promote accountability and self-discipline within the organization.

To meet the capital requirements, KPC/KNPC decided to go for corporate financing for CFP.

The finance comprises a combination of commercial financing from Local and International (Conventional and Sharia Compliant) banks and ECAs (Export Credit Agencies) supported Finance.

Clean Fuels Project (CFP)

Objectives

- Develop KNPC refineries into an integrated merchant refining complex to **meet diversified future marketing requirements**
- Meet future market demand and specifications for **Local & International markets**
- Upgrade & add high conversion units of MAA and MAB refineries to reduce Fuel Oil (from 23% to 5%) to **high value products**
- Enhance the **environmental & safety** performance of KNPC refineries.
- Respond effectively to KPC / KNPC **strategic directives**
- Provide employment opportunities for **Kuwaitis** and **boost local economic development.**

STATUS: EPC is in progress with **68.8%** overall completion.

Now I wish to briefly discuss the road towards stable and balanced oil markets;

If I were to sum up the last year in the global oil and gas business, the word that comes to mind is "interesting," and even that would be an under-statement. Oil prices tumbled, not without precedent, but certainly beyond anticipation, and the market reality we inhabit presently is anything but similar to the one we were in more than a year ago.

- The current imbalance needs an international commitment (OPEC and NON OPEC) to rebalance markets again. OPEC role is vital and essential for the rebalance of the markets.
- The recovery towards rebalance has started, but we need to understand that the surplus will need more time to be drawn. I am confident that the second half of 2017 will show the rebalance.
- The price level is the product of market developments and fundamentals, and I believe that $ 50 per barrel is a level that will continue with us probably until next year. However, $ 60 per barrel is likely to be also there but subject to continued draw down in the stocks.
- The $ 70 per barrel is not there until the market absorbs the additional crude expected from Libya, Nigeria, possibly Iraq and Iran.

Finally, with the implementation of mega projects, I am sure KNPC will be in a position to capitalize on the market opportunities and meet the challenges ahead in order to be among the regional leaders in refining. Furthermore, prices have to recover to levels that will encourage investments. Having two years of reduction in investments' allocations for upstream on global basis will certainly not be for the well-being of the industry, and hence oil prices will need to recover to the acceptable levels that would stimulate adequate future investments.

The 18th Nikkei Global Management Forum

Each year, the Nikkei Global Management Forum - TOKYO, brings together some of the world's most accomplished business executives to discuss corporate strategies, management philosophies and the latest global trends.
The theme of the 18th forum was "Achieving Breakthroughs in an Uncertain World".

REFINERY REVIEW

A NEWSLETTER FROM MAB OPERATIONAL PLANNING

Crude throughput was higher than Plan during the quarter (269.9 KBPD actual vs 264.6 KBPD Plan)

ARDS-12 II catalyst change completed in April'17 & ARDS-12-I Catalyst change commenced from 9th June 2017

Coker -20 M&I shutdown completed in quarter

HCR-14 feed rate was enhanced to extent possible level despite lower availability of conventional feed by undertaking various in-house PIP steps like CGO and Raw Diesel processing in HCR-14

PERFORMANCE UPDATE

APRIL – JUNE 2017

Crude thruput	: 269.9	KBPCD
Distillate yield	: 57.4	Wt%
Fuel Oil	: 24.8	Wt%
Loss	: 1.3	Wt%
EII	: 86.3	
Ref Utilization	: 73.0	%
Conversion units utilization	: 69.8	%

LATEST PRICE AND PERFORMANCE UPDATE

- Crude prices varied between 300-384 $/ Ton (i.e. between 41.6 – 53.1 $/ Bbl) during the quarter
- LPG prices were lower than Naphtha for Apr-June'17 (About 32-46 $/ ton gap)
- ATK prices were lower than 500 PPM diesel for Apr-June'17. (Average prices - ATK : 59.2 $/ Bbl and 500 PPM Diesel : 59.6 $/ Bbl)
- Fuel Oil prices ranged between 274 to 315 $/ ton during the Apr-June'17 (Avg 294 $/ton)
- HCR-14 profitability averaged 14.8 $/Bbl, while Coker-20 profitability averaged about 9.8 $/ Bbl during the quarter

NEWS IN BRIEF

- Oil is in downtrend, Average ICE Brent oil prices have fallen from 53.8 $/bbl from Apri'17 to 47.6 $/ Bbl till June
- Crude Oil demand is expected to grow by 1.27 million barrels per day
- Current Crude Oil supply per day is about 57.7 million barrels from Non OPEC, 32.3 million barrels from OPEC & 6.5 million barrels of NGLs
- Product margins in Europe & Asia inched ahead on healthy demand
- Additional crude oil barrels from Libyan & Nigeria have started to flow into market

Source : Oil News/ EIA survey

MAB PERFORMANCE HIGHLIGHTS

- SHU Tank farm was merged with MAB from 1st April'17
- IRT Lines VGO/ARDR/Mogas were made over ground from underground within MAB Battery limit
- ARDS TR-I S/D for Catalyst replacement commenced from June'17
- Conversion unit feed rates were lower due to feed availability/ARDS S/D @ MAB/MAA
- HSAR transferred to MAA in March-April '17 to sustain ARDS feed rates
- Operating Costs for MAB have increased by 8-10 Million $ due to part of SHU operating costs

KHT UNITS

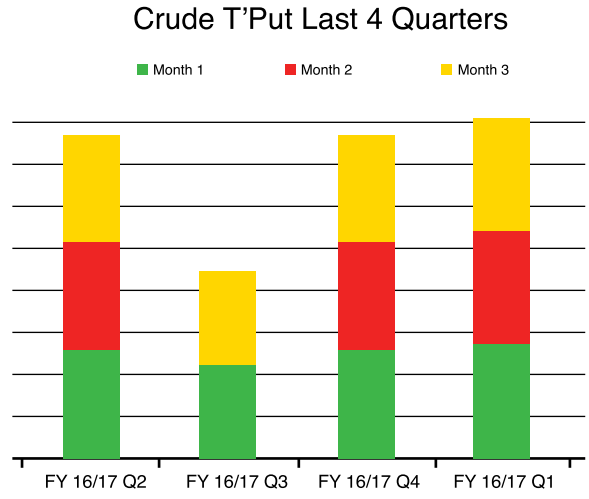
Post-CFP, MAB will have 2 trains of KHT Units: KHT 15/ 115: 40/39 KBPD; Total: 79 KBPD

DEFINITIONS

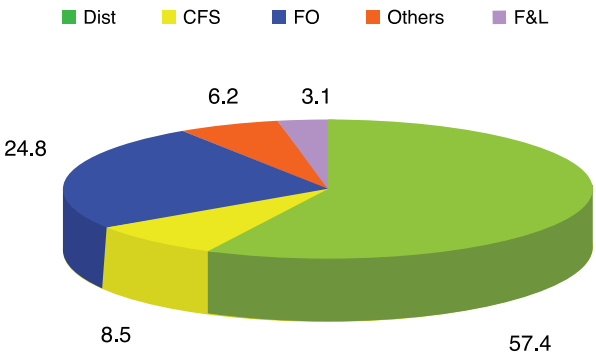
Gross Margin: Gross product value – Raw material cost.

Gross product value is the product of net product yields multiplied by relevant price.

Refinery raw material cost is the product of quantities of input multiplied by relevant price



Crude unit feed rates



Product yields wt%

MAA OPERATIONS OVERVIEW- LAST SIX MONTHS

Feed quality:

Avg sulfur content in crude feed % wt.: 2.74 (Maximum: 4.4)

Avg API: 30.3 (Maximum 35.4)

Capacity:

CDU #3 average throughput 107.00 KBPD

CDU #4 average throughput 158.76 KBPD

CDU #5 average throughput 121.3 KBPD

PRODUCTS: AVERAGE PRODUCT QUALITIES & CAPACITIES OF MAIN PLANT & PRODUCTS (LAST SIX MONTHS)

Plant	Details	Value	Design
LPG-TRAIN I/II/III	CAPCITY-mmscfd	956	1109.43
	C-2 in C-3- mol %	0.3	2.0
ALK	PRODUCT -RON	96.6	---
MTBE	Purity (ex C-5)	98.88%	---
	RON	110.48	---
N-GOD	Feed Sulphur-wt.%	1.36	1.5
	Product Sulphur-wt.%	0.004	0.0045
KDU	Feed Sulphur-wt.%	0.23	0.20
	Product Sulphur-wt.%	0.0179	0.01

MODIFICATIONS IN LAST SIX MONTHS:

- Provision of H2S analyzer on treated fuel gas lines from Absorber in HSR
- Provision of H2S analyzer FOR Absorber outlet treated gas of TGT-54/55
- Provision of Separation facility to prevent carryover of sour water with sour slop oil from RMP/ FUP Sulphur block sour water system.
- Debottlenecking of SWT – 56 Stripper overhead line and PCV
- Change in type of Demister in 4th Sulphur condenser

FINANCIAL ECONOMICS OF REFINERY OF LAST SIX MONTHS:

Description	Aug-17		Jun-17		Apr-17	
	Qty (TON)	Value US $	Qty (TON)	Value US $	Qty (TON)	Value US $
MAA-REFINERY						
Total Input (Opening, Purchase, Import, etc.)	2,612,734	875,738,724	2,380,901	802,149,741	1,859,692	690,839,762
Crude receipt	1,870,084 MT/ 13,461,428 BBL		1,810,977 MT /13,030,550 BBL		1,060,048 MT /7,645,516 BBL	
Net Sales Revenue	2,521,352	1,025,325,322	2,269,029	868,847,951	1,708,702	691,488,972
ACTUAL FINAL PROFITABILITY/ (LOSS) $/BBLS	6.13		(-0.57) (unit shutdown)		(-12.85) (unit shutdown)	

MAA-GAS						
Total Input Cost (rich gas, lean gas, SHU, MAB etc)	1,591,382	544,637,254	1,662,157	538,447,625	1,575,033	553,017,752
Net Sales (Revenue)	1,539,383	631,378,823	1,541,380	571,145,276	1,559,003	622,381,377
ACTUAL FINAL PROFITABILITY/ (LOSS) $/TON	39.7		0.97		24.15	

MAA REFINERY PERFORMANCE AS PER SOLOMON STUDY REPORT (YR-2016)

Category	Actual Value	Ranking (Total Study)	Ranking MIDDLE EAST) (study
Financial:			
Net Cash Margin, USD/bbl	3.09	3	3
Net Cash Margin, USD/t	22.31	3	3
Return on Investment, %	6.2	2	3
Cost of Transportation Fuels, USD/bbl	45.9	1	2
Cash Operating Expenses:			
Total, USD cents/UEDC	52.4	3	3
Non-Energy, USD/EDC	122.7	4	4
Non-Energy Cost Efficiency Index (NEI)	193.1	4	4
Energy:			
EII	93	3	3
Energy Cost Index, USD cents/UEDC	9.9	1	2
Energy Cost Efficiency Index (ECEI)	108	3	2
Carbon Emissions Index (CEI)	93	2	3
Reliability and Maintenance:			
Mechanical Availability, %	96.4	2	2
Operational Availability, %	94.4	3	3
Maintenance Cost Efficiency Index (MEI)	152.9	3	3
Non-Turnaround Component	126.4	4	3
Turnaround Component	26.5	2	2
Maintenance Index, USD/EDC	35.7	3	4
Non-Turnaround Index, USD/EDC	29.5	4	4
Turnaround Index, USD/EDC	6.2	2	2

SULPHUR HANDLING FACILITY

BY: OPERATIONS TEAM, MAA

INTRODUCTION:

The sulphur handling facility (SHF) at MAA is provided to handle the molten sulphur generated in KNPC refineries (MAA, MAB), KOC and EQUATE by converting it to solid form using the Granulation Process. The Granulation Process is basically a size enlargement treatment in which molten Sulphur is converted to small granules or 'SEEDS', layer by layer until the desirable size range is achieved. This process helps in avoiding pollution due to dust and difficulties in handling/storage, transportation and loss during transportation.

In order to meet future molten sulphur production, new facilities, including new granulation units, were installed in addition to revamping of existing sulphur handling units. The new facility was commissioned on July-2017.

THE TYPICAL FEED & PRODUCT SULPHUR COMPOSITIONS TO/ FROM MAA-SHF:

Feed Molten Sulphur		**Product Sulphur**	
COMPOSITION	**Wt %**	Particle shape	Generally spherical
Sulphur	99.5 % Min	Size	3 – 6 mm
Organic	Nil	Angle of repose (in static condition)	25 – 27 degrees
Ash	0.5 Max	Friability	< 2%
Carbon	Nil	Bulk density	1140 – 1200 kg/m3 (packed)
Acidity	Nil	Moisture content (before loading)	< 0.5 %
Moisture	Nil	Purity (Moisture free basis)	99.5 wt % Sulphur
H2S	15 ppm Max	Granule Sulphur temperature	70 – 85ºC
Specific gravity	1.8 @ 28ºF	Color	Bright yellow
Temperature	132 – 154 deg C		

SULPHUR HANDLING/PROCESSING FACILTY

The molten sulphur supplied to MAA-SHF from different sources as per the following:

	Current				Future				
SOURCE	KOC	EQUATE	MAA	MAB	NAGRP	MAA (CFP)	MAB (CFP)	KGOC	KOC
(MT/DAY)	135	65	1200	580	266	400	1350	537	1100

Molten sulphur from KOC, KGOC and Equate is designed to be transferred by sulphur trucks. However, the molten sulphur from KNPC refineries is received through pipelines to SHF in MAA refinery. All Sulphur pipelines are protected against low and high temperatures by thermostats that ensure proper operating temperature (130 – 140 ºC).

The SHF at MAA has sulphur storage tanks (4 old and 4 new), molten sulphur feed pumps, granulation units (3 old and 5 new), conveyors, storage (2 old and 1 new), truck loader and ship loaders (1 old and 1 new).

MOLTEN SULPHUR STORAGE TANKS

Molten Sulphur from the plants is stored in 'Intermediate Storage Tanks' (8 NO.). The tank details are as follows

TANKS	Total CAPACITY (MT)	DIA. (M)	H. (M)	Design Pressure (Bar)	Design Temp (°C)	Precautionary measures
CONE ROOF (EXISTING)	14,880	14	13.9	0.14	160	Snuffing steam with ON/ OFF valves for fire protection
CONE ROOF (NEW)	19,146	16	13	0.010 bar	170 deg C	Snuffing steam injection based on tank temp.

GRANULATION UNIT

The Procor GRANULATION granulating process is a size enlargement process in which molten Sulphur is applied to small granules or 'seeds', layer by layer, until the desired size range is reached. By repeatedly applying a layer of molten sulphur to the granules and then cooling and solidifying each layer, the seeds increase in size.

By this step enlargement process, the granules can be produced at the size best suited for handling, transportation and friability.

SCRUBBER SECTION:

The process of granulation generates sulphur dust, which causes environmental pollution. This dust is quenched with DM water, and the sludge generated is recycled to the process.

This effluent air enters through 18" air duct to the venture section of the dust collector. Here the scrubbing water is introduced. As the water is atomized into fine droplets, the dust present in the air gets entrapped with water, which are subsequently removed by cyclone separator. Water is recycled from the scrubber to the water tanks.

DRUM DISCHARGE CONVEYOR:

The conveyor can carry up to 76 ton/hr. The belt travels at speed of 100 fpm. The conveyor is 0.76 m wide and 21 m long.

PRODUCT STORAGE AND TRANSPORTATION:

The granules can be either stored in circular store (2 existing circular stores 45,000 MT each) and longitudinal store (new 145,000).

From these storage areas, Sulphur granules are sent for shipping through ship loader or truck loader.

SHIP LOADER

The ship loader is designed for loading sulphur granules to ships (The existing system loads up to 30,000 DWT with 400 ton/hr capacity, while the new system loads up to 60,000 DWT with 1,500 ton/hr capacity).

In order to adapt the machine to the size and height of the ship hold floor, the loading facility is telescopic with upper & lower working position at an angle of + 15° & – 15° respectively.

To make the ship loading dust free, the machine is fitted with a dust collection system.

LOCAL MARKETING PERFORMANCE

WALEED ALBEAIJAN
MANAGER, LOCAL MARKETING

KNPC Local Marketing Department was formed with an objective to serve as main storage, distribution, marketing facility to meet the Local Market demand of petroleum products in the State of Kuwait.

To facilitate storage, handling and efficient and adequate supply of products & to fulfil Local Market demand, KNPC LM had set-up two storage & distribution facilities i.e. Depots at Sabhan & Ahmadi Depots.

Sabhan Depot located near to Kuwait Airport is in operation since 1979. The Depot includes along with other facilities, storage tanks for Gasoline (58 Million Litres), Gasoil (17 Million Litres) and Kerosene (4 Million Litres).

The Ahmadi Depot located at Ahmadi was commissioned in 1999 to supply products to southern part of Kuwait. It also has storage tanks for MOGAS (39 Million Liters) & Gasoil (15 Million Liters).

Depots receive five finished products (Premium UL-91, Super UL-95, Ultra UL-98, Gasoil & Kerosene from KNPC's Refineries Mina Al-Ahmadi (MAA) & Shuaiba (SHU) for onward supply & distribution to Local Market. Depots and have been equipped with latest receiving, loading and firefighting facilities. The Depots operation is achieved through integrated and most advanced Online Operation System.

In Kuwait, Local Market for petroleum products comprises of Retail & Bulk Sector. KNPC-LM is sole supplying entity for petroleum products to both Retail & Bulk Sector. In Retail Sector, petroleum products are supplied to Gas Stations, popularly known as Petrol Filling Station (PFS). There are total 130 number of PFS spread across the State out of which 45 are owned & operated by KNPC and remaining by private Filling Companies namely M/s. Al-Oula (42 no. of PFS) & M/s. Al-Soor (43 no. of PFS). Bulk Sector comprises of approx. 500 different categories Customers.

PRODUCT RECEIVING AT DEPOTS FROM MAA AND SHU REFINERY

SABHAN DEPOT:

Premium and Super are received from MAA and SHU through 12" pipeline, while Gasoil and Kerosene are received from SHU and MAA through 10" & 8" pipeline respectively.

AHMADI DEPOT:

Premium and Super are received from MAA and SHU through 12" pipeline. UL-98 is received through 6" line from MAA. Gasoil is received through 10" line from SHU simultaneously with Sabhan Depot.

PRODUCT LOADING AT DEPOTS

Both the Depots are equipped with product loading Gantries with 34 loading bays (22 at Sabhan & 12 at Ahmadi Depot)

- The loading arms are designed to fill tankers at a rate of 1500 LPM.
- Loading gantry instrumentation is provided to ensure safe filling operation with grounding verification, tanker verification, overfill protection and vapour hose connection during filling operations.
- Loading Arms are all bottom loading at both Depots.

VAPOUR RECOVERY UNIT (VRU) AT SABHAN & AHMADI DEPOTS

In order to eliminate HC vapours sneaking into atmosphere while loading / unloading or transfer operation and in line with KNPC's HSE Policy to run the business to safeguard health of our employees and minimize environmental emissions, KNPC-LM implemented Project for Vapour Recovery Unit at Sabhan & Ahmadi Depots for Gasoline products.

Since inception of VRU in 2008, total 34 million litres of vapour are recovered from both Depots.

PRODUCT CONSUMPTION YEARS FROM LM DEPOTS

Current daily average product consumption in Local Market for FY 2017/18 is as follows:

UL-91: 7 million litres, UL-95: 4.5 million litres, **UL-98**: 0.15 million litres,

Gasoil: 5.4 million litres and Kerosene: 0.45 million litres

Total Gasoline: 11.56 million litres

Till 2015-16, Premium consumption has decreased, whereas for Super & Ultra steady growth occurred. From 1st September 2016, due to MOGAS price increase, there was heavy impact on consumption pattern. Public opted less cost Fuel more than higher cost, as a result Premium which earlier constituted 20% of MOGAS consumption ratio, increased heavily and became 58%, and Super dropped from 78% to 40%. Ultra consumption also dropped appreciably.

Major portion of Gasoil & Kerosene is consumed in Bulk Sector for various types of Industries. These products experienced steady but appreciable growth owing to overall industrial & infrastructure growth in the State of Kuwait.

FUTURE EXPANSION

As the State of Kuwait is fast growing Country in terms of industrial & infrastructural growth, there is continuous increase in demand of Petroleum Products. Hence, in order to cater to increased demand requirement, KNPC-LM is poised for two major expansion projects as below, which will enhance products storage & dispatch to a large extent.

1. Expansion of Ahmadi Depot: Addition of Tanks and Loading Arms. This project is under execution and expected completion by June 2018.

2. New Depot at Matla: Totally new Depot at Matla @ 60 KM northeast of Kuwait City to serve new locality. This project is under study & approval stage and expected completion by 2026-27.

MARKET RESEARCH: OIL MARKET OVERVIEW

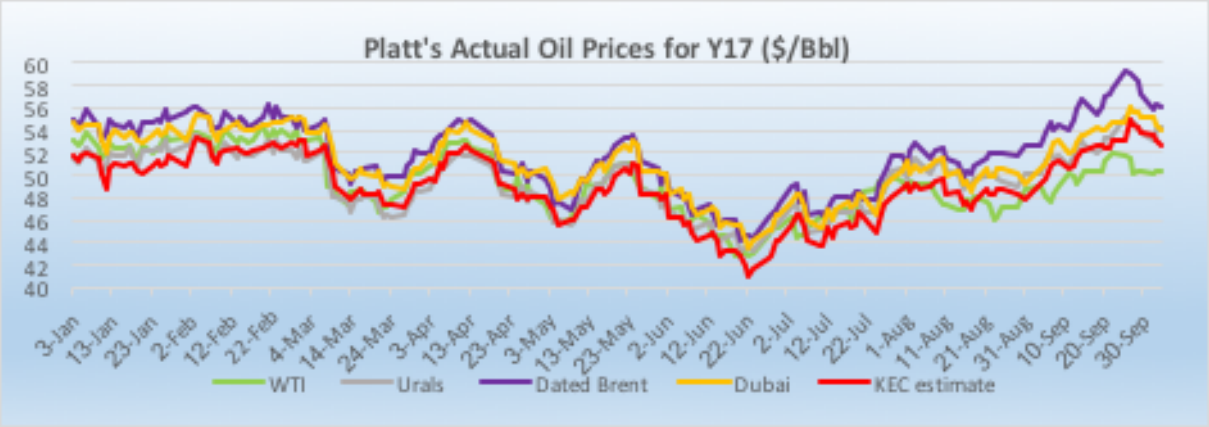
NAILA BAQER
Team leader Market Research

YASMINE KHALED
Market Research

‘This Chapter will provide you with Market Research Division latest coverage of the global oil market to keep you informed of key market developments’

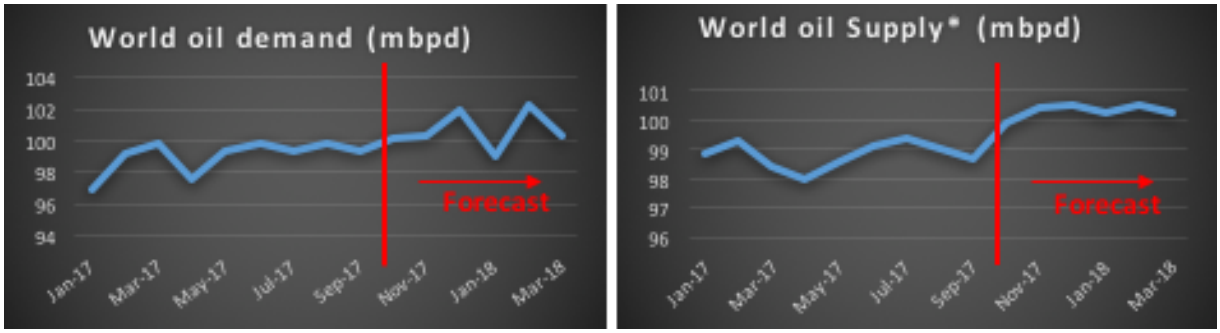
1-GLOBAL ECONOMIC GROWTH is on track to be the strongest (since 2011) this year, and even a little better in 2018. World real GDP growth will pick up from 2.5% in 2016, to 3.1% in 2017, and 3.2% in 2018, led by the United States and emerging markets.

2- OIL DEMAND & PRICES OUTLOOK: International oil prices have inched up over the past few weeks, with Dated Brent trading around $55/Bbl in recent days. The prospect that OPEC will keep a lid on production beyond March-18 and recognition that global demand is buoyant, were helping to push prices higher. Key OPEC ministers and Russia's Energy Minister are open to the idea of extending the production cut deal. Discussion of this issue will take place at the 30 November 2017 full ministerial session in Vienna. Below is a chart showing S&P Global Platts Actual Oil Prices for Y 17 (to date):



Despite **OPEC** efforts to balance the market and high compliance, global inventories are expected to remain at high levels through Y18. Oil prices are expected to be lower on average in 2018 than in 2017. Yet, despite a lower outlook for OPEC output and continued robust world oil demand growth, it is expected that the global liquids demand-production balance will loosen on average through end-Y18. This is because of expected strong annual average crude output growth in 2018 from a group of non-OPEC countries including the United States, Canada, Brazil, the United Kingdom, and Kazakhstan; as well as from Libya and Nigeria. The graph below is showing Dated Brent and WTI-Cushing crude oil price History & Outlook to 2018:

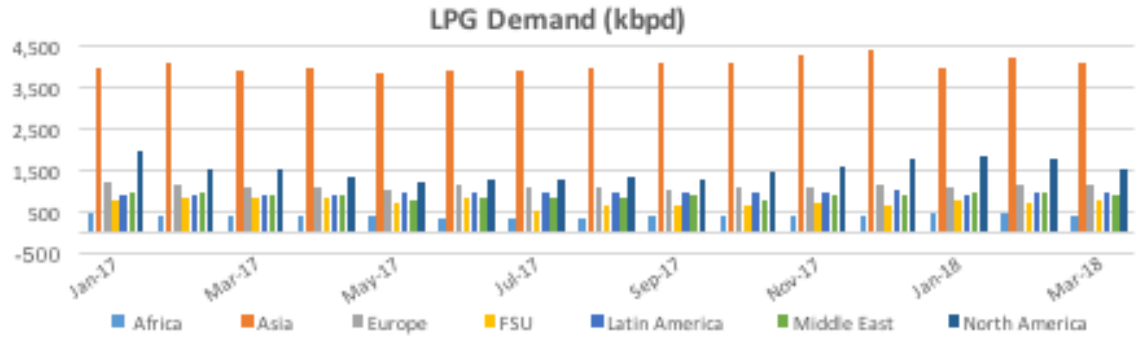
World liquids demand is forecasted to rise by 1.8 mbpd in 2017 and similar volume in 2018. The graphs below are showing Y 17 Monthly World Oil Demand and Supply in addition to the forecasted values up to Mar-18.

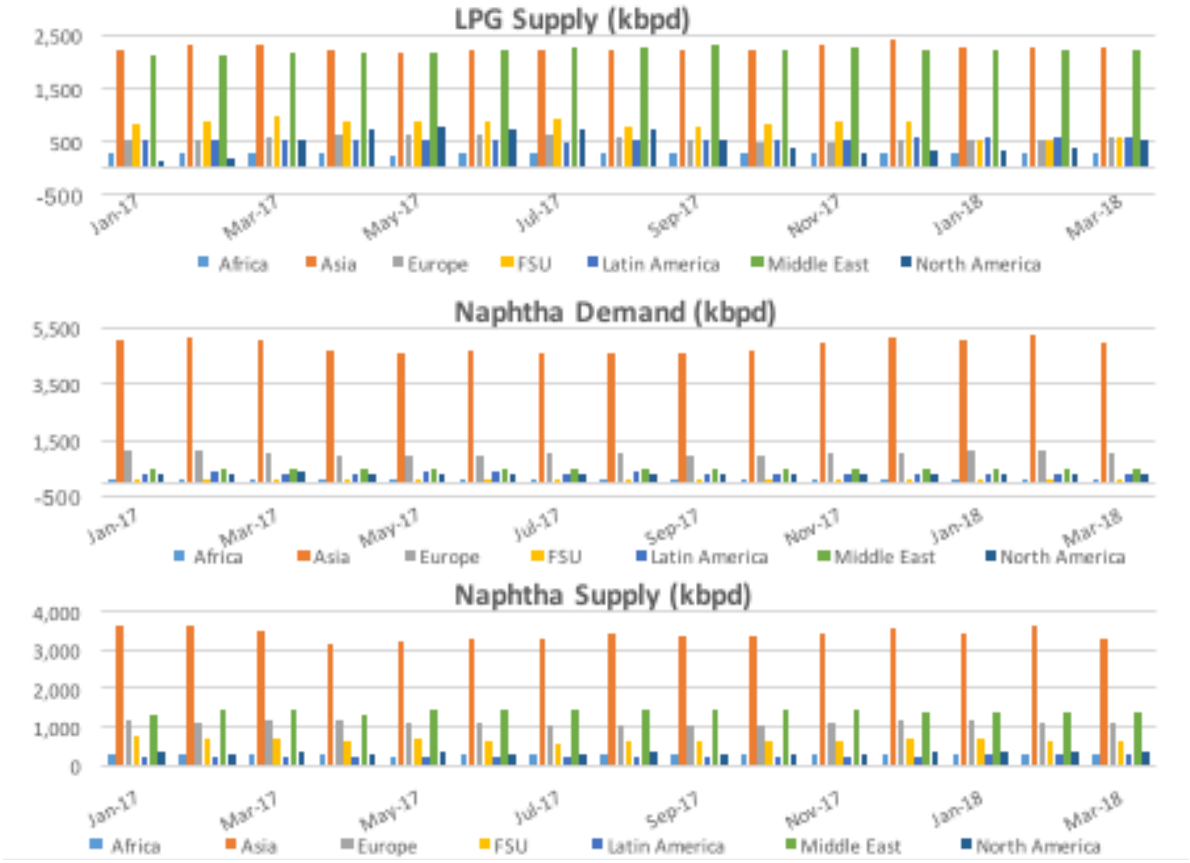


3-GLOBAL PRODUCT OUTLOOK:

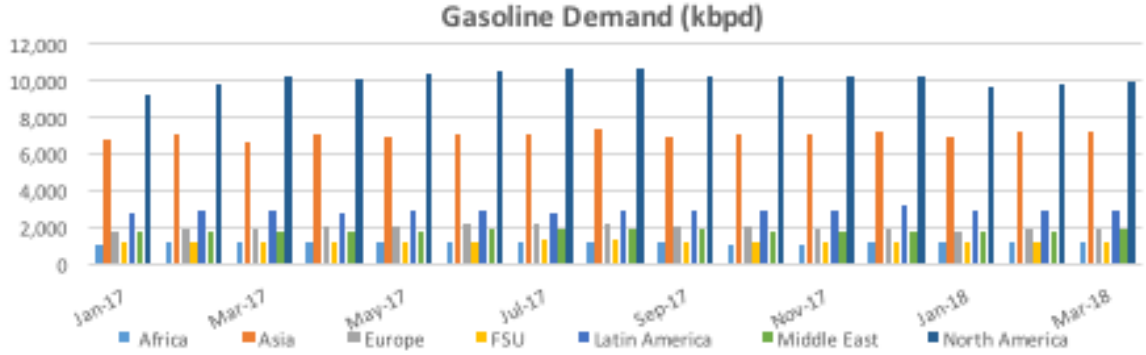
Last year, margins have shown elevated levels due to strengthening of product demand growth, corresponding crack spreads and unexpected supply disruptions (refinery turnarounds, crude supply risk, etc.). The "summer" driving gasoline demand supported seasonal margins uplift but margins are expected to decline from current peak "summer" levels, starting in late 3Q 17. Margins will face downward pressure in Y 18 because of the ongoing need to remove high inventories (crude and refined products). Starting 2019, refining margins are expected to improve significantly in the years surrounding the IMO bunker fuel implementation compliance year in 2020.

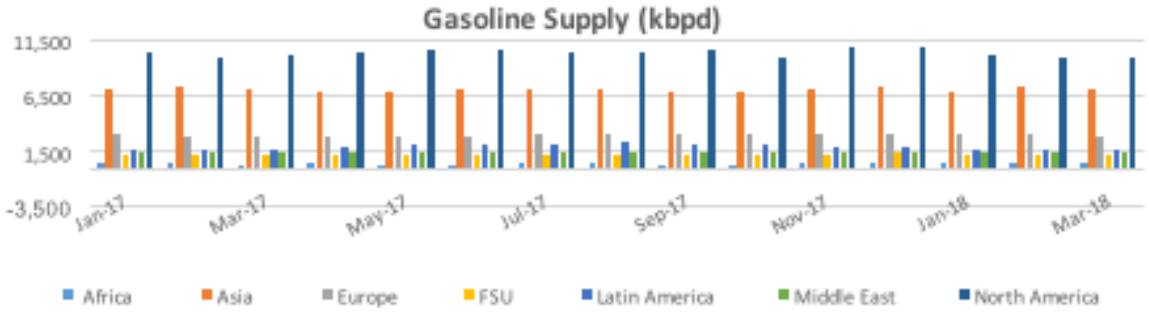
Naphtha: Expected decline in the US gasoline inventory (after Hurricane Harvey) has supported both the gasoline and naphtha markets globally. However, the situation is likely to normalize, easing the naphtha market from October onward. Naphtha demand in Asia and the Middle East (ME) will continue to be strong, as more petrochemical crackers will be back from their turnarounds with high utilization amid robust margins. In addition, the economics of LPG processing as petrochemical cracker feedstock will remain unattractive, supporting the naphtha market. Naphtha supply in Asia and the ME is expected to improve as regional refineries optimize their operations to produce light distillates amid strong margins. Lower refinery outages and the addition of new refining capacities in India and China would counter market sentiments by providing more regional supply.



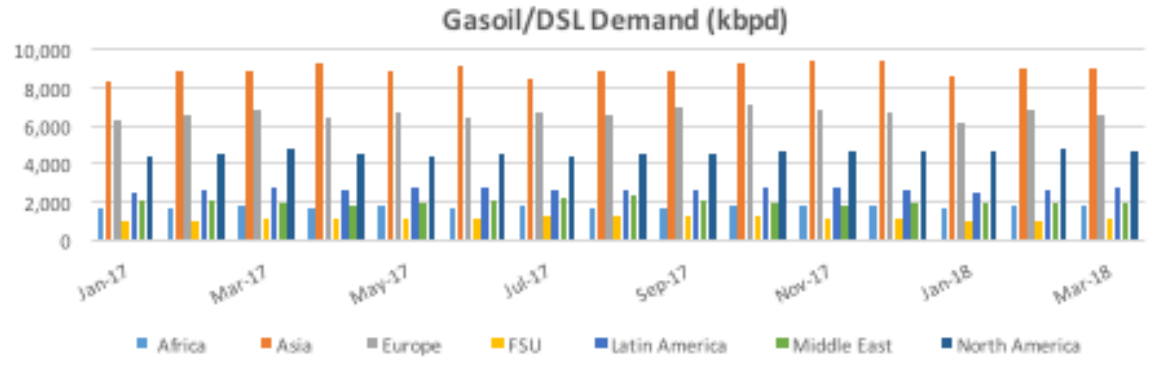


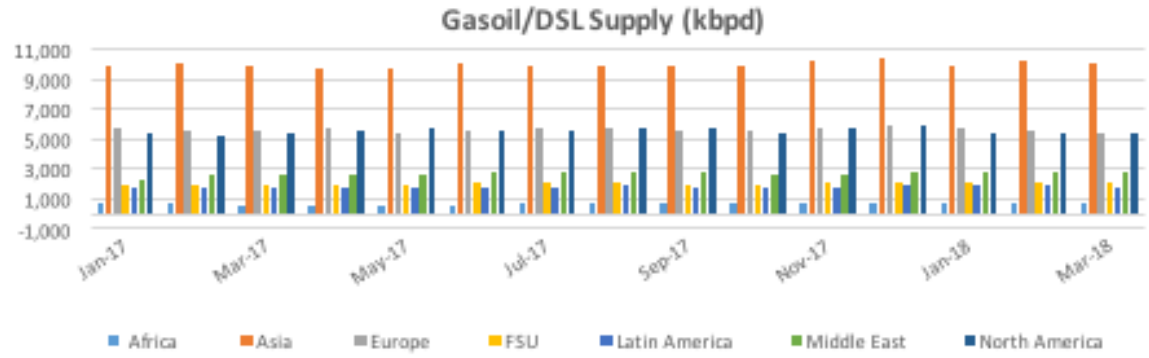
Gasoline: Improving supply from Asia and the ME refineries and off-seasonal demand from the West will weigh on the market, particularly from October once the effect of Hurricane Harvey subsides. Higher exports from China as a result of the new refinery capacity additions and potential increase in export quota in the fourth quarter will pressure as well. However, strong demand growth and relatively lower Gasoline inventories would support the Asian market. Gasoline is and will continue to be the most important refined product in terms of demand growth in Asia and the ME, supported by increase in car sales in the developing markets.





Gasoil/Diesel: Continued healthy demand growth in Asia and the ME led by China, India, and Australia will support the market. However, the market is expected to moderate afterward, with normalization of the supply situation in the United States and improvements in regional supply. The situation in Latin America, where regional supply has been restricted due to to regional refinery outages, is particularly aggravated following the refinery outages in the United States as the country has been mostly exporting to Latin America instead of Europe. This has been and will continue to be supportive for Asian market. Asia and the ME Gasoil supply will remain robust because of stable refinery crude oil processing and the processing of relatively lighter crude slate. However, some refinery outages as part of the autumn refinery turnaround season and uptick in regional demand ahead of the winter season will provide some support.





EXPERIENCE WITH OPTIMIZING STEAM TO GAS RATIO IN HYDROGEN PLANT

AHMAD IBRAHIM ALBAGHLI

Team Leader – Strategic Planning

ABSTRACT

This article talks about the experience in optimizing the steam to gas ratio in the Reformer of the Hydrogen Plant of Mina Abdullah Refinery (MAB) and the major parameters considered in order to achieve that goal and conserve as much energy whilst meeting the required Hydrogen quantity and quality for all the catalytic units users in the Refinery.

Moreover, the ethos and broad message I would like to convey here is that one must be dynamic to surrounding changes and, accordingly, pursue the continual improvement through revalidation, challenging the current conditions and taking advantages and utilizing opportunities.

Best speaker Award to Al-Baghli

INTRODUCTION

Hydrogen is a crucial component in the refining industry. The combined hydrogen consumption in MAB exceeds 200 MMSCFD serving two atmospheric residue desulphurization units, three hydrotreaters and one hydrocracker unit. Hydrogen production units in MAB Refinery use Steam Reforming Technology, where natural gas and steam react together in the presence of catalyst to produce the hydrogene.

The key process parameters for optimizing the Hydrogen production in the steam reforming process are Steam to Gas ratio (S/G), Reformer's Outlet Temperature, and Pressure. A balance between those controlling parameters should be kept optimum to meet the important desired conditions to produce the right specification and amount of hydrogen with using less amount of energy.

The optimal condition can be achieved by applying the minimum sufficient steam to gas ratio, as it is realized that the cost of steam is higher than compensation by fuel gas to raise reformer's temperature. Less steam to gas ratio saves energy, yet, one still needs to pay attention to steam to gas ratio. If it is too low, then carbon formation is likely to take place in the reformer's tubes causing deterioration in the heat transfer and affecting the life cycle of the equipment.

MAB HYDROGEN PLANT CONFIGURATION

MAB Refinery has three identical trains of hydrogen plants that apply the steam reforming technology. Each train is capable of producing 52.8 MMSCFD. The basic steps involved in hydrogen production processes in MAB are:

steam reforming, steam generation, carbon monoxide shift conversio,carbon dioxide removal.

INTEGRATION OF HYDROGEN AND STEAM SYSTEMS IN MAB

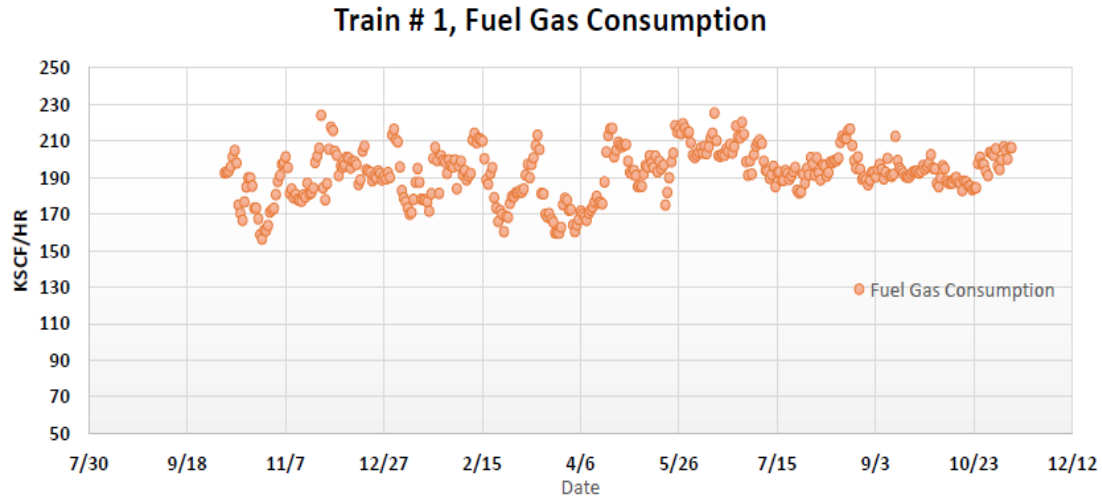
Steam network in MAB Refinery is congested and integrated with most of the Refinery units for energy optimizing. In case of power loss, MAB Hydrogen Units will continue runing as back up for producing steam to the refinery steam network rather than supplying Hydrogen.

Different from the original design, the network of the hydrogen for Refinery has a new external source as an outcome of refinery and petrochemical integration project which has a higher purity hydrogen. Also, the old Hydrogen Unit was working only as a stand-by unit.

OPTIMIZING STEAM TO GAS RATIO IN MAB UNITS

Generally, older plants were designed for quite conservative steam to carbon ratio in their reformers. Specifically, for conventional non-PSA hydrogen plants, steam to carbon ratio ranges from 5.7 to 5.9, is needed for achieving the desired product purity in terms of methane content as well as for avoiding reduction in the energy available for stripper reboiler in the CO_2 removal system. For those plants, reduction in steam to carbon ratio may not be much feasible unless combined with higher reformer outlet temperatures, which in many cases could be constrained. Thus, a careful evaluation of the product hydrogen purity versus increased capacity should therefore be undertaken.

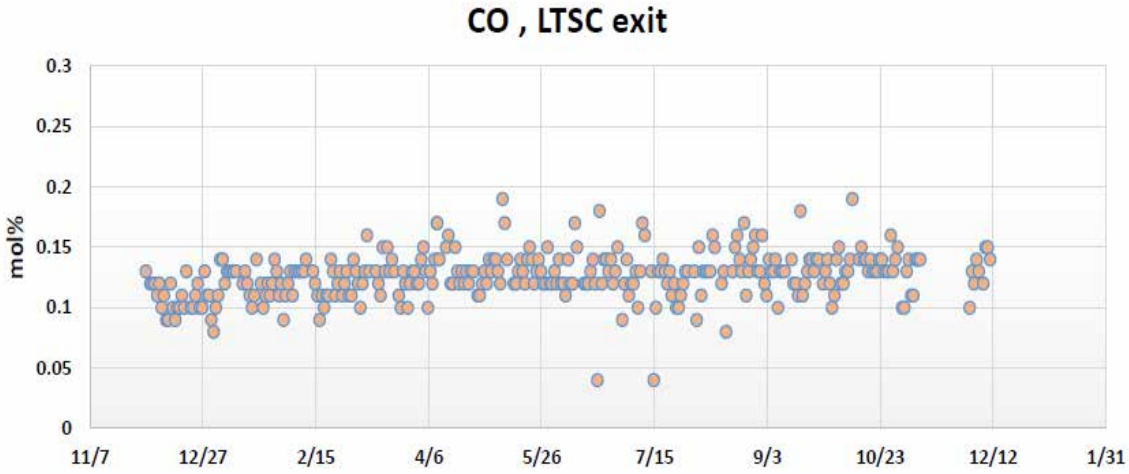
So, with careful monitoring of methane slip and skin temperatures of reformer's tubes, trail runs were carried out to reduce steam to gas Ratio. It was possible to reduce the ratio gradually to 5.3, without compromising on hydrogen product's purity and yield.



Trend of steam to gas ratio

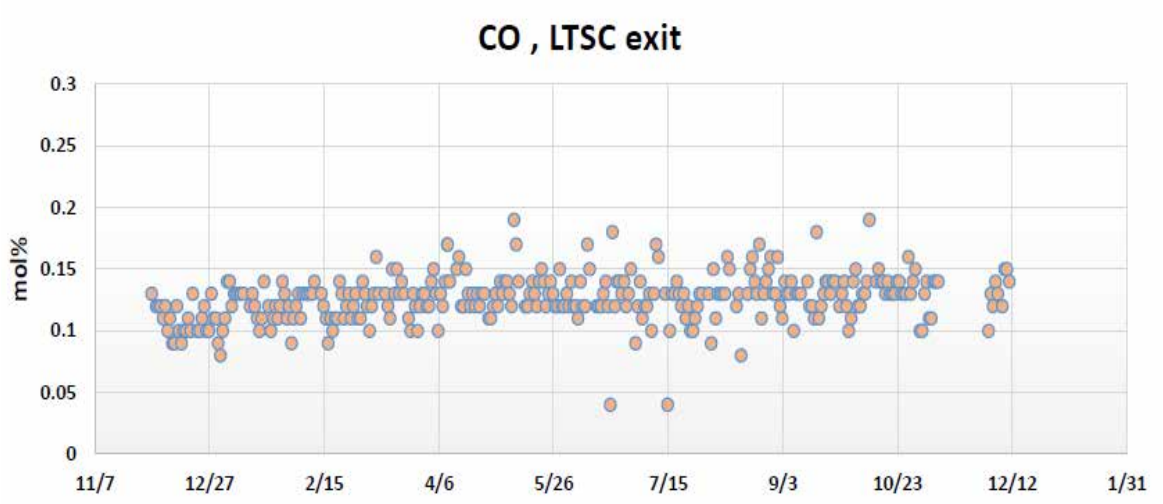
Lowering the steam to gas ratio has a dual effect. A higher reformer exit temperature is needed to achieve a given methane slip, and higher CO slip in shift which may require resuming the steam to gas ratio in order to maintain final product purity.

Compensation in reformer outlet temperature for the reduction in steam to gas ratio, to maintain the methane slip of 3.1 mol% or less limitation in the reformer exit, found to be minimal in this case. Reformer outlet temperature was raised from 1425°F to 1450°F, which is still within the operating window. This increment did not raise the fuel consumption a lot, as the mass flow rate of the process feed is less with lower steam to gas ratio.



Trend of fuel gas consumption

Effect of lower steam to gas ratio on the operation of downstream shift reactors also found to be marginal. No significant increment in CO slip from LTSC was observed, which might have consumed additional hydrogen in the downstream Methanator reactor and lead to lower product purity.



Trend of CO at LTSC exit

Post reduction of steam to gas ratio, reformer tube skin temperatures still reported less than 1600°F. It was only marginal rise in the tube skin temperatures. Visual inspection of reformer tubes does not indicate any hotspots, which may appear due to carbon deposition in case of insufficient steam.

CONCLUSION

By utilizing the changes of circumstances in the hydrogen network conditions, it was found that out of the three controlling process parameters of the steam reforming process, steam to gas ratio having a scope for optimizing towards operating the Units profitably whilst meeting the hydrogen's quantity and quality, and retaining the integrity and safety of the equipment. So, even with lowering the steam to gas ratio from the 5.9 range to 5.3, it was possible to meet the yield and purity of the desired hydrogen product without significantly affecting the fuel consumption, the reformer outlet temperature and the tube skin temperatures.

The most important message and moral I would like to convey is, there is always a scope for improvement. Conditions, situations and even life are vibrant and dynamic and we shall always take it as opportunities turning out for our advantage. One should not be habitual. But, often re-assessing, re-examining, re-evaluating and optimizing in line with changes taking place in our surroundings.

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RESEARCH

CHALLENGES, OPPORTUNITIES AND LESSONS LEARNT IN REVAMP OF FCC UNIT

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SUBHASH SINGHAL
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BACKGROUND

Mina Al-Ahmadi Refinery has a UOP Fluid Catalytic Cracking Process Unit which was designed in 1984 for a feed rate of 30,000 BPSD of VGO. The unit started up in 1987, consisting of a high efficiency style combustor regenerator and downturned arm riser termination system in the reactor with feed injected into the riser wye. It has since been revamped once by UOP in 1997, to increase to 40,000 BPSD with feed either of VGO or HVGO and some coker gasoil. PRU/MTBE/ALKY units were added as part of MAFP Project in the same revamp. Recently in 2015, the unit has been revamped for a capacity of 42,500 bspd and for heavier feed to meet CFP requirements.

November, 2017
Issue No. 01

Since the startup of the last revamp in the year 1997, KNPC and UOP were discussing the possibilities for increasing the unit's capacity further, and possibly upgrading the technology in order to process heavier feeds and improve yields. The capacity of 42,500 BPD was selected as the design basis for the Fluidized Catalytic Cracking (FCC) revamp as part of the Clean Fuels Project (CFP).

PROJECT OBJECTIVES

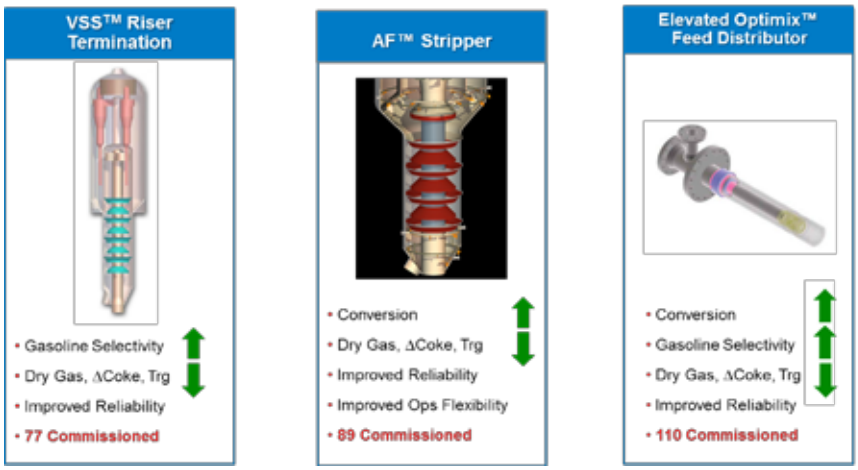
For CFP project, KNPC set out certain objectives specific to FCC revamp:

- Improve unit Reliability & On Stream Factor
- Process difficult feed stocks & optimize conversion
- Key to meet local Gasoline and Propylene commitments
- Extended operation run length
- Sustained operation at higher capacity
- Improved Environmental Performance (Flare less during start up, SOx & control of Particulate emissions)

The FCC unit was revamped to process more difficult feeds while updating the reactor side technology.

UOP Solutions:

UOP proposed the following technologies to be incorporated:



UOP's FCC Technology Solution

FCC REACTOR

- Vortex Separation System (VSS)
- AFTM Stripper internals
- Optimix Feed Distributors

Air and flue gas circuit equipment:

- Additional auxiliary air blower
- Cold wall flue stand pipes, flue gas lines, modified regenerator cyclones and New cold wall Orifice chamber.

MAIN FRACTIONATOR

Replace trays in Top four sections (LCN/ HCN fractionation, HCN pump around, HCN/ Distillate fractionation, Distillate pump around) with random packing to save expensive WGC modifications.

GAS CONCENTRATION COLUMNS

Replace internals in different sections with high capacity trays.

The three key reactor technologies to enable profitability and reliability improvements are the Vortex Separation System (VSS) riser termination device (RTD), UOP AF Stripper internals, and UOP OptimixTM Feed Distributors.

The VSS RTD greatly improves gasoline selectivity through superior vapor catalyst separation, minimizing post riser cracking. Similarly, delta coke and dry gas will be reduced along with regenerator temperature. The reliability of this device is proven and 77 of these have been commissioned since commercialization in 1995.

AF™ Stripper internals represent the latest in FCC stripper technology, reducing delta coke through improved stripping efficiency leading to a conversion increase from the boost in catalyst to oil ratio.

Optimix™ Feed Distributors are elevated in the FCC riser which allows for a lower density and even catalyst regime for feed injection.

Each technology reduces delta coke and this is an additive quality that can improve regenerator operations and boosts flexibility of feed processing and operating severity.

KNPC GASOLINE (MOGAS) POOL CHALLENGES AND SOLUTIONS

Gasoline is the premium product for KNPC. Some of the challenges foreseen for CFP and their solutions were:

- High-sulfur gasoline from FCC Unit would be addressed by installing FCC light and heavy gasoline selective desulfurization.
- High-Aromatics gasoline components would be mitigated by installing an Isomerization unit and a DIP unit for reducing olefins and aromatics.
- KNPC Mogas pool currently meets Benzene specifications as two existing CCR Units at MAA Refinery are designed to meet the Benzene specification.

KNPC PROJECT CHALLENGES

Challenges were seen thoughout all stages, be it in FEED, Construction, Pre-commissioning and Post-commissioning Stages.

CONCLUSION

The close collaboration between UOP and KNPC technical and project teams enabled improved refinery profitability through improved product slate, especially Gasoline and Propylene yield as the FCC revamp met all unit processing objectives while maximizing use of existing assets.

Challenge of improved run length from the current three to four years and operational availability is under assessment and can be addressed after completion of current operating cycle, something which had not been previously possible in KNPC's history, thereby improving the overall refinery profitability further.

ALTERNATIVE CLAUS UNIT CONTROL STRATEGY

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Gas Operations Department – MAA

ABSTRACT

Mina Al-Ahmadi Acid Gas Removal Plant (AGRP) is a gas sweetening facility designed to treat 230 MMSCFD of sour gas and 39 MBPD of sour condensate at 2.5% H_2S and 8% CO_2. The recovered acid gases are processed in an AGESRU-TGT unit loop in order to convert 99.9% of H_2S into sulfur. Since its commissioning in 2003, the Tail Gas Treating (TGT) has been experiencing multiple issues that prevented its smooth and continuous running. These issues were mainly soot formation from SCOT line burner and the instability of reactor temperatures either due to unstable SRU control.

The TGT unit was successfully kept in operation for nearly seven months for the first time in 2014/2015. However, in late 2015, the outdated air demand analyzers failed, thus preventing continuous operation. Despite a replacement project being in progress, execution could not be done in time. Running the Tail gas unit without proper control was not an option.

An alternative feed-forward control strategy based on Feed H_2S was implemented and found satisfactory with regards of emissions control without TGT in line. With the new scheme, emissions were reduced from 4148 ppm to 3044 ppm in average. On the other hand, the new scheme reduced the standard deviation from 1623 ppm to 763.6 ppm thus ensuring better control of the process.

After extensive adjustment and testing, the decision was taken to go ahead with TGT start-up with the alternative controls. TGT reactor temperatures were found steady and emissions successfully reduced from 3044 ppm to below 500 ppm.

INTRODUCTION

KNPC-MAA Refinery is operating Acid Gas Removal Plant (AGRP) built in 1998 and commissioned in 2001. The associated Sour Gas and Sour Condensate feed from West Kuwait Gathering Centers are treated by means of an amine system. The stripped acid gases (25 – 30% H_2S content) are then routed to an AGE-SRU-TGT loop designed to achieve 99.9% sulfur recovery.

Since its commissioning, the TGT has suffered from multiple issues, among which are the soot formation at the line burner as well as tail gas ratio control issues. This required the plant to run with TGT in by-pass condition to the Incinerator, thus increasing emissions from below 500 ppm (design condition) to as much as 4148 ppm in average. After many improvements, the Tail Gas Treating Unit (TGTU) started for a total of 7 months in 2014/2015. However, both SRU's tail gas analyzers failed beyond repair and required a replacement project. The latter could not be executed in time, thus rendering the TGT startup very difficult.

The used methodology came-up with workable solutions to stabilize the Sulfur Recovery Unit (SRU) emissions and ultimately restart the TGTU to reduce MAA AGRP SO_2 emissions.

METHODOLOGY

The methodology required going through five DMAIC steps: Define, Measure, Analyze, Improve and Control.

Problem definition

In absence of TGT, the incinerator stack rejects a flue gas containing 2000 to 5000 ppm of SO_2 (75% of the time) with sudden increases above 10000 ppm which will produce a thick white flume. Internal KNPC target considers anything above 8000 ppm as a recordable incident.

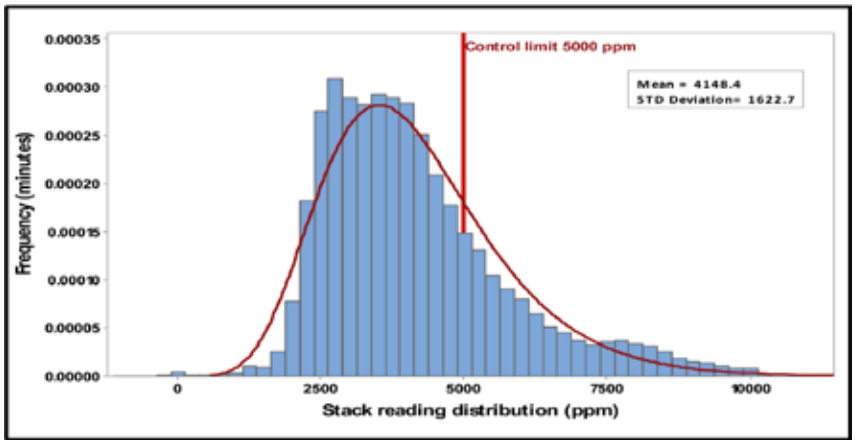

Figure 1. Incinerator Stack SO2 distribution (ppm) from June to September 2015

Measurement system validation

Stack emissions are measured by means of a UV/IR type online SO_2 analyzer. Crosschecking was kept 3 times per week and recalibrated when large differences were found.

Analyzing the problem

A root-cause analysis was carried out. Poor stoichiometry and absence of a sound SRU control (failed tail gas analyzer) were the two main causes of the system's poor performance in absence of TGTU and tail gas analyzer.
In fact, poor stoichiometry is one of the biggest reasons of lost recovery in a Claus unit. The Claus process is a chemical process and exact control of the reaction stoichiometry is required in order to achieve maximum efficiencies.
Another possible cause for spikes in H_2S readings could be H_2S slip from AGE absorber directly to the incinerator.

Conceptual solutions

The acid gas line to both SRU trains is equipped with a UV/IR H_2S analyzer that is used to guide operators during tail gas analyzers failure or preventive maintenance. Since it is a gas plant setup, only H_2S, H_2O and CO_2 are expected to be present in significant quantities. Prior to the Six Sigma project, Control room operators were given an (H_2S – Air ratio) equivalence table to follow in such cases. However, though this was much better than the trial and error approach, this method failed due to:

- Necessity of very close follow-up.
- Errors related to flow measurement.
- Variations in SRU feed and composition.
- Errors in concentration measurement.

However, many previous works have reported success with the Combination of feed-forward and feedback control methods.

A critical question came to us: What would happen if such a combined scheme was already implemented and the tail gas analyzer still failed? The feed-forward loop would have to run alone with feedback control disabled. Based on that idea, we decided to control both SRU trains using a feedforward control loop only. The possibility of combining both control strategies would be evaluated in a later stage after new tail gas analyzer installed.

Results

The comparison between data before the new scheme and after the calibration shows that the Stack SO_2 reading average dropped from over 4100 ppm to below 3044 ppm. On the other hand, the new scheme reduced standard deviation from 1623 to 763.6.

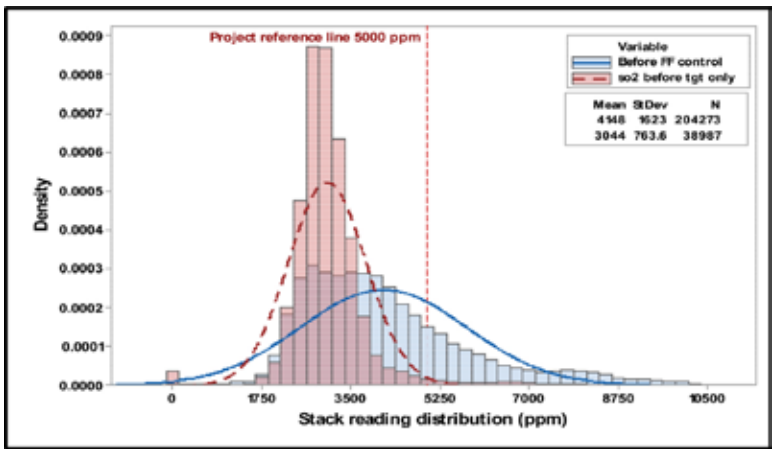

Figure 2. Incinerator SO2 Stack Reading Before and After

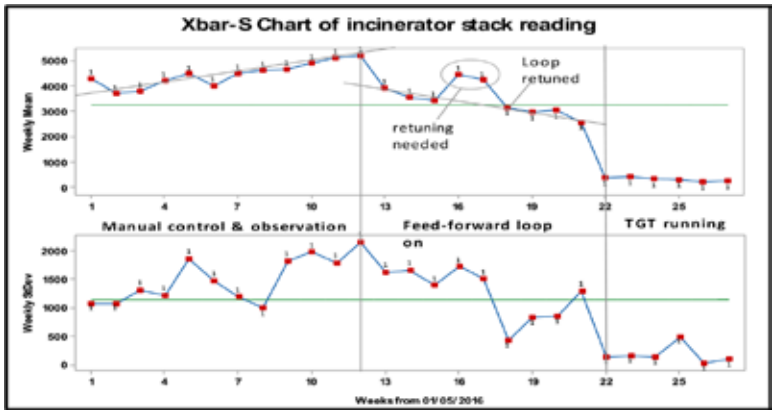

Figure 3. Moving Mean and standard deviation from the period of May to November 2016.

Figure 3 is a plot of weekly SO_2 reading mean and standard deviation from 01/05/2016 to 28/10/2016. Once the new loop implemented (week 13), the new mean consistently dropped until TGT was started (week 23).

TGTU start-up

After TGT start-up, the incinerator stack SO_2 reading immediately dropped below 500 ppm. Reactor outlet temperature was found to be stable and no sudden variations beyond 310^o C were observed.

Sigma level comparison

The process capability analysis carried out under Minitab 17 helps identify the sigma capability of the process before and after the improvement, by means of distribution fit. The Z-bench value is linked to the sigma level through a capability shift usually estimated at 1.5σ. Hence:

$$\sigma\_level = Zbench + 1.5$$

Because of reducing the mean and standard deviation, the new process improved from 2.2 to 4.1 sigma level thus delivering on the Six Sigma project expectation (Figure 4 & 5).

Based on the above, the decision was taken to go forward with TGTU start-up based on the new feedforward control strategy. Based on the data after TGT start-up, the process was very reliable and was evaluated at 7 sigma level (Figure 6.

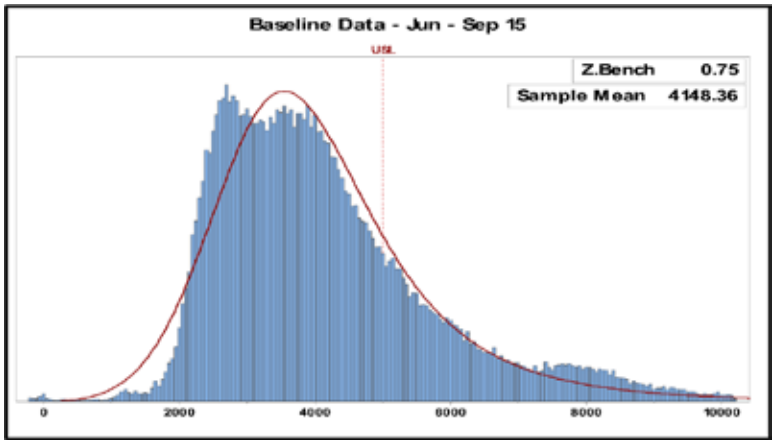

Figure 4. Process capability analysis Jun-Sep 15 (σ-level = 2.25)

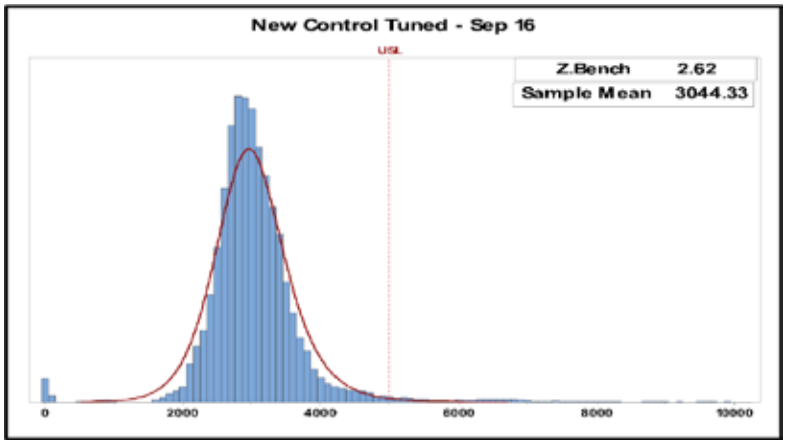

Figure 5. Process capability analysis Sep 16 (σlevel = 4.12)

THE CONTROL PLAN

The following actions were identified to keep the process healthy:

- To keep the feed H2S analyzer healthy by frequent maintenance and calibration. Also, an upgrade to measure other species such as Hydrocarbons and NH3 could be beneficial to improve control.
- Air demand Analyzer to be upgraded as soon as possible.
- Feed-forward control loop can be crosschecked and calibrated.
- Stack analysis to be carried out three times per week.

CONCLUSION

For most Claus unit applications, the feedback control remains the best control strategy to reduce sulfur emissions and improve TGTU control. However, in many cases, plants have suffered from frequent failures of the air demand analyzer for multiple reasons. The above work was an attempt to mitigate the absence of the air demand analyzer and propose an alternative way to reduce emissions with quick and limited means. In the case of MAA AGRP, only in-house software modifications were necessary.

In new Claus units design setup, we strongly recommend the inclusion of an acid gas feed H2S analyzer with a similar control loop to maintain the air demand under control, whether the tail gas air demand analyzer requires small or extensive maintenance. For better control, other works have proposed combining feedforward and feedback controls simultaneously.

However, note that the above work was conducted in a gas plant setup, where NH3 and Hydrocarbons were not expected nor observed in SRU acid gas feed. In a refinery setup, a similar setup might work if the acid gas feed line is equipped with an analyzer capable of measuring multiple species.

SUCCESSFUL IMPLEMENTATION OF EXPANDED IMS PROJECT

UJWAL RITWIK
senior Specialist - TPL

INTRODUCTION

Wednesday, 17 May 2017 shall be remembered at Kuwait National Petroleum Co. for a long time to come. This was the day when the Certification Auditors announced the award of three ISO certificates to KNPC. The company thus successfully implemented the program to unify Quality Management System (ISO 9001), Occupational Health & Safety Management System (OHSAS 18001) and Environment Management System (ISO 14001) certifications.

Initially, these certifications were attained separately a few years back, but the challenge was to integrate them in one single Integrated Management System (IMS), in a short time span and for whole of KNPC, including all of its facilities, personnel and activities.

The project was kick-started on 29.11.2016 and was successfully concluded with the Certification Audit on 17.5.2017.

MANAGEMENT SYSTEMS JOURNEY IN KNPC

For the last 30 years, the oil & gas industry has seen a gradual and upward evolution of management systems, especially in occupational safety & health, environment and safety. KNPC has followed the trend and on some issues led the way. It has been a fascinating journey. In early 1980s, there was no formal/certified management system at KNPC. Organization was mainly dependent on the best available practices, governmental regulations and employees' competency & experience. After initial release of ISO 9001 standard in 1987, a few Departments & Divisions at KNPC implemented the requirements of QMS based on the ISO 9001 standards and were individually certified.

The years from 1991 to 1995 saw a major effort in unifying safety processes at Mina Abdullah (MAB), Mina Al Ahmadi (MAA) and Shuaiba refineries. The first was a work permit system. Soon after it was followed with release of unified Safety Regulations Manual dedicated to safe work practices. Process for unified Major Incidents Plan Procedure (MIPP) was initiated in 1988. After a pilot implementation at MAB in 1993, MIPP was adopted all across the company.

In 1996, the first procedure for HAZOP studies was established across KNPC. Site teams were formed to conduct and monitor initial and cyclic hazard identification and review for plants.

Another landmark achieved in 1996 was Technical Services Agreement with CONOCO. Safety was one of the four streams under the agreement. CONOCO experts assisted KNPC to establish their Process for Continuous Safety Improvement, PCSI. This was first ever safety management system at KNPC, had 14 elements based on OSHA PSM standard, CFR 1910.119 of USA.

A corporate HSE Department was established in 1999 by merging safety with the centralized Fire & Security Department. The Environment Division was formed under the Department, the first ever dedicated 'environment' unit at any Kuwaiti company. Professional environment engineers and experts were hired.

June 2000 saw two catastrophic incidents at Shuaiba and MAA refineries respectively that changed the course of thinking towards safety. After doing a wide ranging search and evaluation, DNV was selected as consultant to help build a robust HSE management system. Initially called as Safety Management System (SMS), was later renamed Safety, Health & Environment Management System (SHEMS). CONOCO initiated PCSI was modified, 'environment' was added as a new element, and management commitment was ensured by enhancing their role as the monitor of the program by formation of Safety, Health & Environment Executive Committee (SHEEC). In 2004, for the first time anywhere in Kuwait, at KNPC, an Occupational Health & Industrial Hygiene programs were implemented. The program incorporated compliance to EPA - Kuwait limits, and internationally recognized best practices and standards.

KNPC emerged as the leader in implementing environmental measurement and monitoring and several improvement process were initiated. To build over these successes, ISO 14001 certified Environment Management System was established in 2005.

The above was followed in 2010 with Occupational Health & Safety Management System certification based on OHSAS 18001 standard. For the first time again, a major company in Kuwait got certified to this standard. This brought in important concept of owning and maintaining register of OHS risks with every organizational sub-unit. KNPC became the leader in implementation of Enterprise Risk Management. The system was successfully implemented in 2008. This provided a sound basis for KNPC to incorporate risk-based thinking in its decision making process.

A unfied corporate Quality Management System was established in 2011. Until then individual departments and sites had their separate certifications for ISO 9001.

In 2012, KNPC established Process Safety Management system in line with the KPC PSM standards. This was preceded by a long list of activities like gap analysis, formation of task force, conduct of a 'process safety culture

survey', and establishment of several procedures pertaining to PSM. This ultimately culminated in formation of a new division dedicated to PSM.

Between 2010 and 2012 KNPC also revamped its earlier emergency management process MIPP to the new Emergency Response Plan (ERP) and established for the first time a well-crafted and equipped Crisis Management Plan and Crisis Management Center.

CHALLENGES IN IMPLEMENTING INDEPENDENT MANAGEMENT SYSTEMS

Each ISO standard requires its own structure and system. KNPC was certified to ISO 9001, ISO 14001 and OHSAS 18001 and was moving up on maturity level. However, independent management systems posed certain challenges in their effective implementation and maintenance - duplication of processes, systems, procedures and parallel administrative efforts. Management is also faced with multiple audits and reviews.

Integration of the management systems was the obvious next step to overcome all these concerns.

BENEFITS OF INTEGRATING MANAGEMENT SYSTEMS

Integration of management systems enhances the effectiveness and optimizes the resource utilization, including time, documentation and audits by eliminating duplications. KNPC successfully integrated EMS (based on ISO 14001 standard) & OHSMS (based on OHSAS 18001 standard). The integration resulted in:

- Reduced audits, management reviews and follow-up
- Reduced documents, process, systems
- Better control
- Single point contact; IMS Helpdesk

Realizing the incentive from the success story of the IMS, KNPC integrated the PSM and SHEMS in 2015 and initiated integration of QMS (based on ISO 9001 standard) with the IMS in 2016.

THE NEW ERA: EXPANDED IMS PROJECT

In December 2015, SHEEC directed the HSE Department to initiate the integration of QMS with the IMS. In January 2016, a Gap Analysis was performed by TUV Middle East to identify the gaps in the existing management system with the relevant standards.

An IMS Implementation Team was constituted in January 2016 and the Scope of Work for the recertification contract was finalised in March 2016, signed on 14th November 2016 and kicked off on 29th November 2016.

ENHANCEMENT IN IMS IMPLEMENTATION

The objective was to actually utilize the ISO requirements as a vehicle to enhance KNPC process. The following are among the key enhancements incorporated in our management system:

- Adopted "Risk Based Approach" for the internal and external audit management. The frequency of audits is decided based on the risk associated with the activities performed.
- Good internal auditing is the heart of program. Established "Auditor Development Program" to select, train, coach, sustain the competency and monitor the performance of the internal auditors.
- Continuous Professional Development (CPD) is the highlight of this program.
- Organizing focused training on IMS for Management. Participation in this training is identified as Individual HSE Objectives for all levels of management.
- Organizing professional development programs like Pre-Audit and Post-Audit workshops, regular trainings on QMS, EMS, OHSMS and IMS for all employees, including contractor's personnel. Participation in Basic IMS training is identified as Individual HSE Objectives for Engineers, Supervisors and other personnel.
- Development of "Maximo Application" for Risk Register Management and Audit Process Management.
- In conclusion:
- IMS is a potent tool to enhance division and department performance. Its sincere implementation will help the compant improve its overall performance while protecting people, environment, property and image. Every employee, at all levels, has a role to play.

UNIFIED IT FRAMEWORK & NEW IT BOARD

ALAA AL-HUMAIDI
IT Planning

BALAKRISHNAN NAIDU
IT Planning

INTRODUCTION

Framework is a layered structure indicating what kind of program, application and infrastructure can or should be built and how they would interrelate. With this in view, IT Department has recently established the following four Boards in conformance with the COBIT5 Framework:

1. IT Governance Board
2. Change Advisory Board (CAB)
3. Demand and Architecture Board (DAB)
4. Cyber Security Board (CSB)

UNIFIED IT FRAMEWORK

A process to channel all projects within IT Departments into an effective and efficient IT Projects Control Procedure to:

- Ensure IT projects are aligned with strategies and meet business requirements.
- Establish standards
- Comprehensive selection of IT Projects
- Optimum utilization of resources

IT GOVERNANCE BOARD (IT GB)

IT Department has established an IT GB, for:

- better governance over projects
- proper PMO function within IT Department

Also, IT Department nominated IT Planning Division to be focal point for all IT Projects.

IT GB effectively results not just in improved business performance but also in creation of value by developing a structured approach for identifying, developing, leveraging and optimizing technology and other IT resources.

IT GB at KNPC is expected to:

- Establish a unified IT governance platform
- Enable alignment with corporate objectives
- Enhance decision making which will facilitate cost-effective and well controlled delivery of IT services / operations
- Define the overarching structure to provide direction and managerial guidelines for IT operational plans
- Set standards, working principles and operational guidelines for Business

CHANGE ADVISORY BOARD (CAB)

A group of leaders and professionals that advises the Change Manager in the assessment, prioritization and scheduling of Changes. This board is made up of representatives from all areas within the IT department, the business, and third parties such as suppliers.

Roles of CAB:
CAB members review and approve changes based on the following factors:

- Impact of change
- Effect on the infrastructure and end-user service
- Impact on other services that run on the same infrastructure
- Effect of not implementing the change.
- IT, business resources required to implement the change, likely costs, human resources, the elapsed time, and other
- Additional ongoing resources required
- The technical, business, and financial review and approval

Activities of CAB:
Change advisory performs the following:

- Review all submitted Request for Change's. Determine and provide details of their likely impact, Risks, implementation resource needs, and on-going costs of all changes
- Attend all relevant CAB or CAB/Emergency meetings. Consider and give opinion on which changes should be authorized
- Be available for consultation should an emergency change be required
- Provide advice to change management on aspects of proposed emergency changes.

DEMAND AND ARCHITECTURE BOARD (DAB)

Demand Management aims to understand, anticipate and influence customer demand. Demand Management works with Capacity Management to ensure that IT Department has sufficient capacity to meet the required demand. DAB oversees Demand Management and Enterprise Architecture activities and provide inputs and approvals where needed.

DAB activities are:

- Review/Approve the Demand Management and Enterprise Architecture Business Case, Vision, Objectives and Principles
- Review/Approve the Baseline and Target Architectures described as a part of the Enterprise Architecture Definition and Architecture Standards and Guidelines
- Review/Approve the Implementation and Migration Plan

CYBER SECURITY BOARD (CSB)

- Key roles and responsibilities
- IT Security Governance
- IT Security Planning
- IT Risk Management
- IT Security Compliance
- IT Security Operations

CONCLUSION

"Unified IT framework and new IT Boards" initiatives are documented, approved and implemented as part of IT Governance that will lead to effective, efficient IT functioning and conforms to the COBIT5 Framework. "Unified IT framework and new IT Boards" is linked to IT processes, IT resources and tied to ITD Strategies and Objectives for the purposes of supporting KNPC business objectives.

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