Flare Gas Recovery Project at TAKREER Ruwais Refinery

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COSMO OIL CO., LTD.

1. Background and Objectives of the Project

Abu Dhabi National Oil Company(ADNOC) has been actively engaging in environmental countermeasures.

→ Gas Conservation Task Force(1996)

- Instruct the group companies to eliminate or minimize gas flaring.

→ Launch a health, safety and environmental management program(1997~)

- Reducing the flue gas and wasted materials.

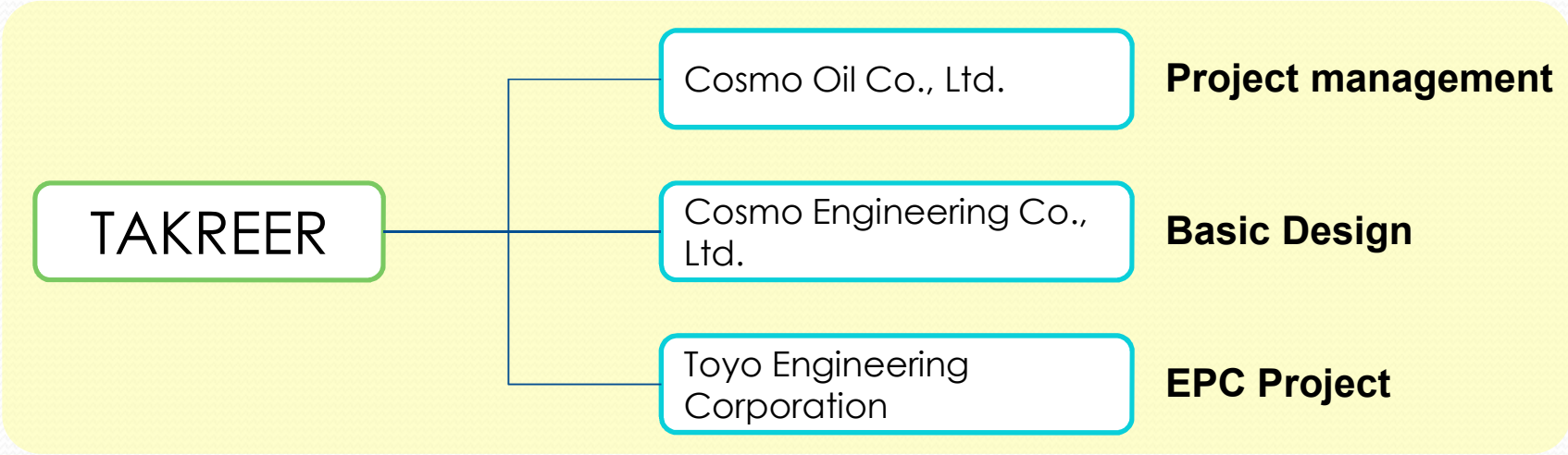
Abu Dhabi Oil Refining Company(TAKREER)

- Tackle the environmental issues
- Making effort to reduce the flare gas

We conducted joint implementation of gas recovery project with JCCP

《 Reduce SOx and CO2 》

2. Project Schedule



Item	2005FY	2006FY	2007FY	2008FY
BasicDesign	→			
Contract of EPC	→			
EPC		→	→	→
Performance test				→
Technical support evaluation				→

3. Ruwais Refinery

Crude Distillation Unit	120,000BPD	
Condensate Splitters	140,000BPD	×2 units

Naphtha, Kerosene, Gas oil Hydrodesulphurization Units

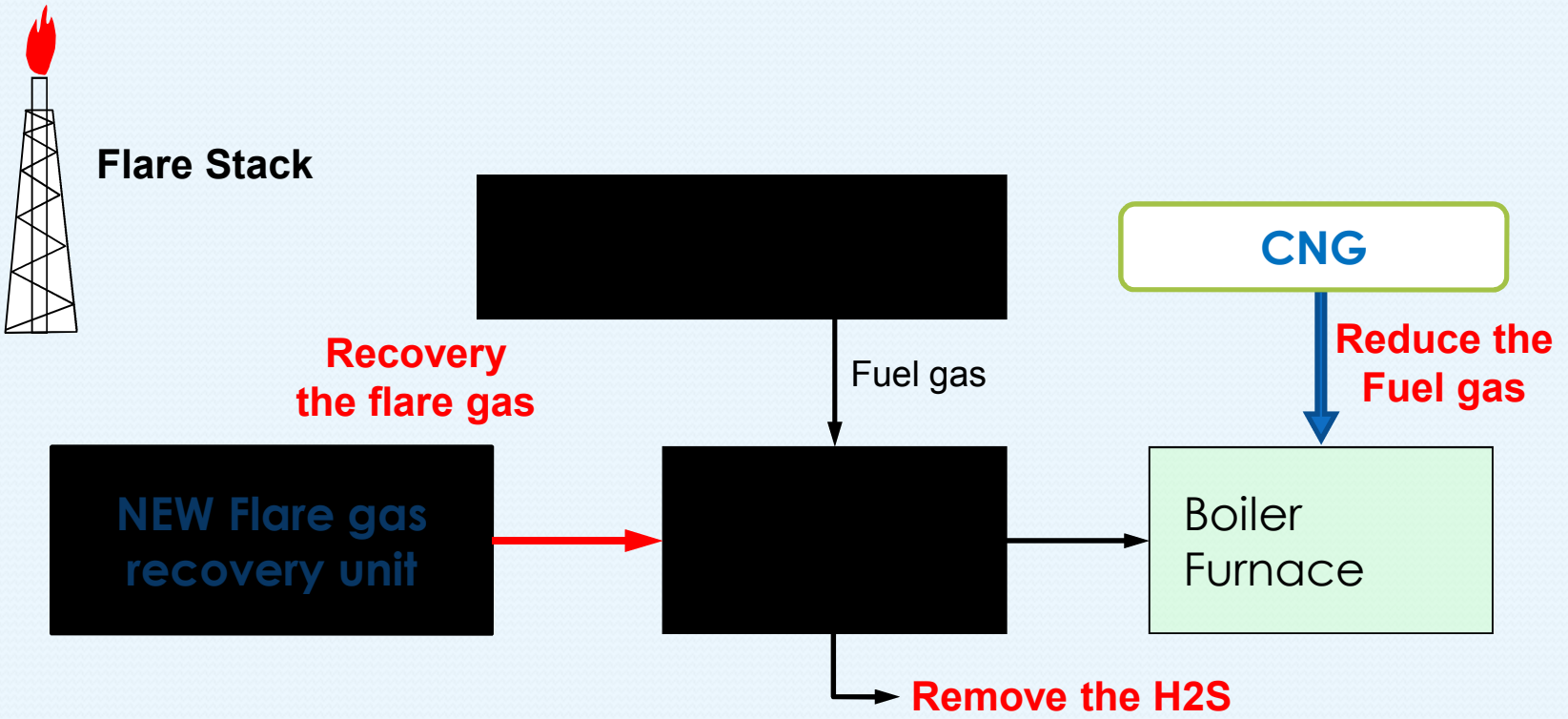
Vacuum Distillation Unit	46,000BPD
Hydrocracker	27,000BPD
Hydrogen Plant	60,000m3N/hr
Sulfur Recovery units	44/49 tons/day

Our target is in the Hydrocracker group

Other

4. Project Overview

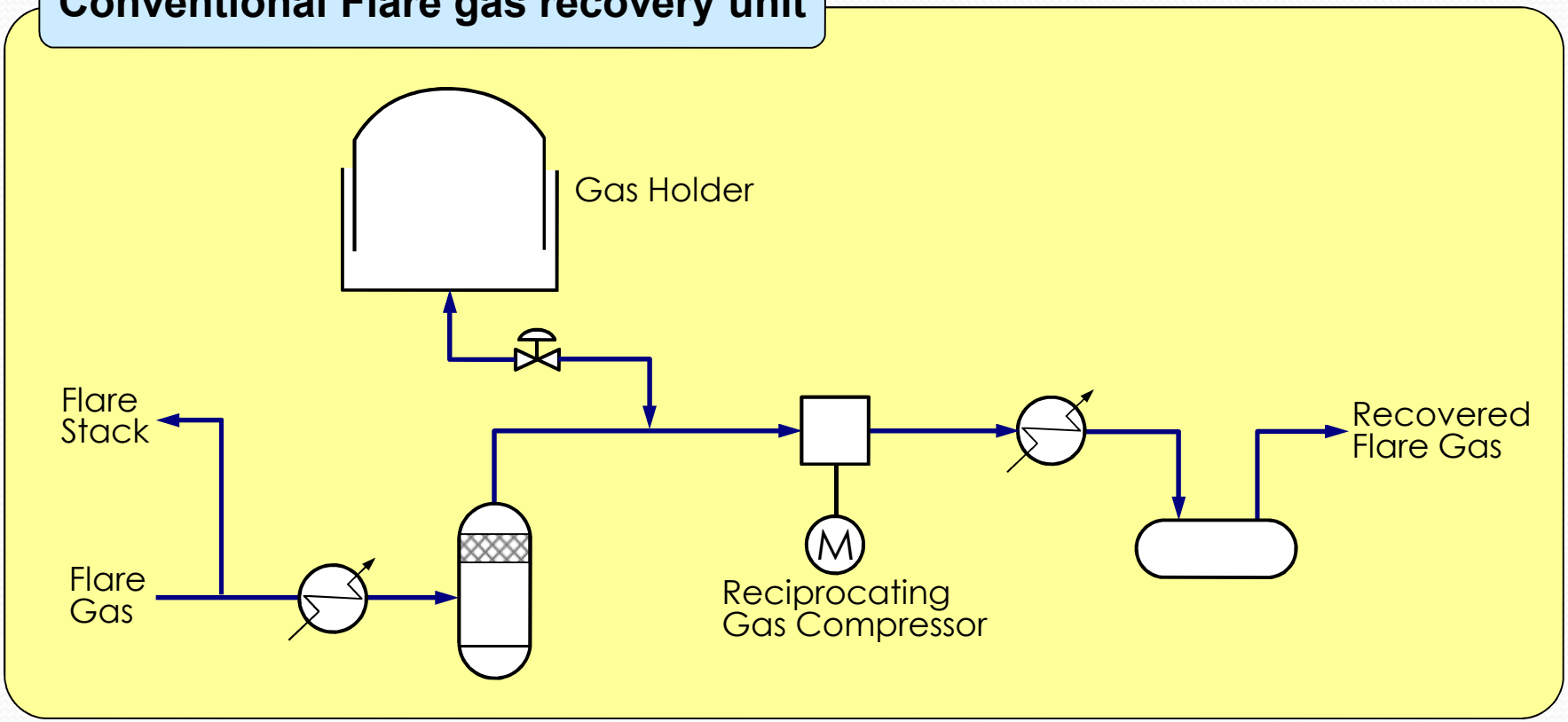
The some units emitted a part of the gas to the flare gas header. And they burn the flare gas in the flare stack.
In this project, we executed the introduction of the flare gas recovery unit in the hydrocracker group.
And we can recovery the flare gas and reduce the fuel gas.



5. Conventional gas recovery system - 1

We have the following facilities for the flare gas recovery.
This system requires a large land by a Gas holder.
We have a lot of equipment for this system , so the operation is complex.

Conventional Flare gas recovery unit



5. Conventional gas recovery system - 2

6. Introduced gas recovery system - 1

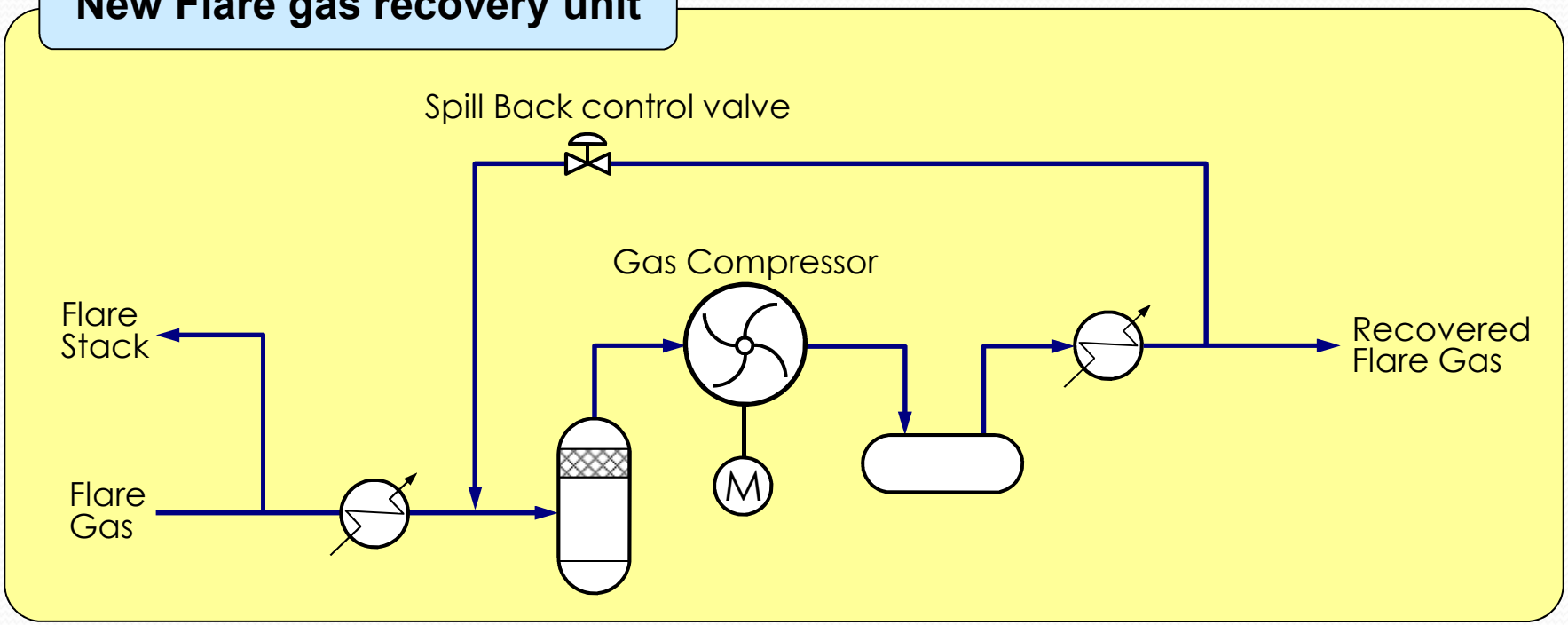
Introduce the Liquid-Ring compressor and Spill Back Control.

a) Stable against fluctuations of flare header.

b) The unit configuration is simple and easy to operation

C) Operating range is wide.(0 – 1,000m^3N/h)

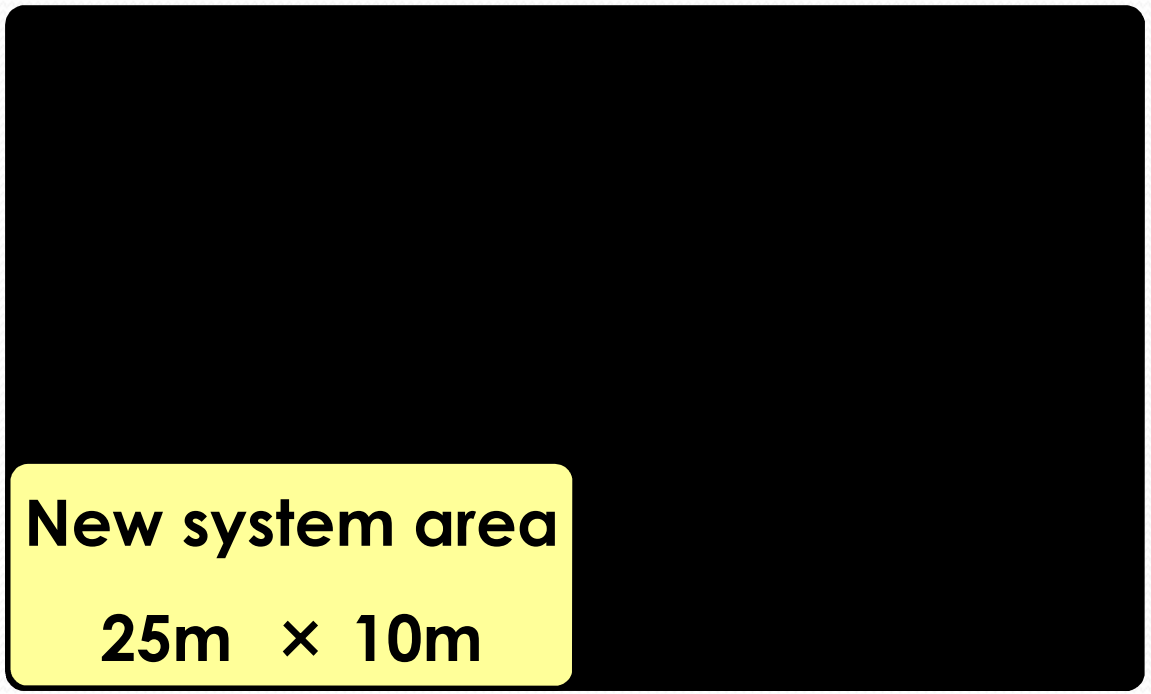
New Flare gas recovery unit



6. Introduced gas recovery system - 2

7. FGR Plant Area

New flare gas recovery unit is a very compact compared to the conventional unit.

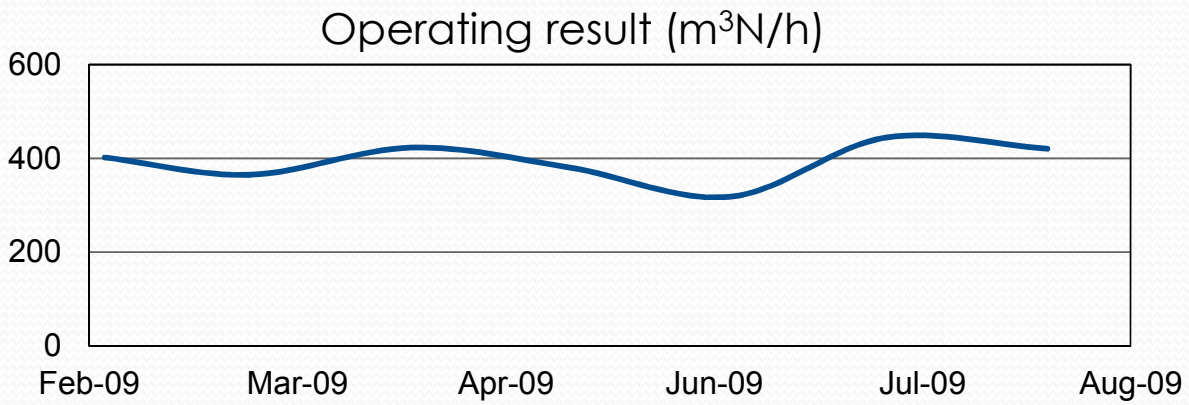


※ Image Figure

8. Project Result - 1

This project is the one greatly contributing to the environmental improvement. Especially, it is the one to achieve the result to the CO2 reduction greatly.

	Operation
[redacted]	About 400
CO_2 reduction(ton/y)	About 7,000
SOx reduction(ton/y)	About 40



8. Project Result - 2

This project is covered ADNOC News and TAKREER News.

News

TAKREER wins the JPI's Award for international Cooperation

TAKREER has recently won an award on 'International Cooperation on Technology' from Japan Petroleum Institute (JPI) in recognition of successful completion and commissioning of "Flare Gas Recovery Project at Takreer Ruwais Refinery'.

The JPI was established in May 1958 under the Ministry of Economy, Trade & Industry (METI) Japan. The aim of the JPI is to promote science and technology related to petroleum exploration and development, production, refining, including petrochemicals and other related areas. It also exchanges information with overseas institutes and associations and promotes relations with organizations in the fields such as natural resources, energy and environmental protection.

The award was officially received on behalf of TAKREER by Mr. Fareed Mohammad Al Jeberi Manager Strategic Studies & Business Development Department-CSD, in a special ceremony held on Tokyo, Japan. It is worth mentioning that this is the first award to be given by JPI to an overseas company.

It is to be mentioned that as a part of refinery processes, some of the gas streams are generally released from various process units and they are collected and burned in the flare stack for safe disposal. The amount of flare gas in case of some process upset can be significant. The losses of these hydrocarbons from different process units can be avoided if some mechanism is provided at flare gas system for recovering the flared gases.

This idea was capitalized in the Flare Gas Recovery Project at Ruwais Hydro Cracker plant. The gases released to flare from various process units are diverted to the Flare Gas Recovery (FGR) Unit. At FGR unit the low pressure flare gases are compressed and sent back to the Fuel gas system for use in Refinery furnaces.

Mr. Jassem Ali Al Sayegh, (Third from lift), TAKREER General Manager and Mr. Ali Abdelrazaq Al Fahim, Assistant GM for Technical affairs, (Third from right) holding the JPT award.

The major advantage of this Project is twofold i.e. instead of wasting gas in flaring it is recycled back to the process furnaces to be used as fuel thus ensuring fuel conservation on one side and also resulting in less Carbon Dioxide (CO2) generation due to burning of these gases at flare. Furthermore, the recovered gases are treated for removal of Hydrogen Sulfide thus also results in low SOx emissions. The project has resulted in saving around 400 NMCA/hr of flared gas which is equivalent to around 7,000 tons per year reduction of CO2 emission.

This energy conservation & environmental improvement project was installed and commissioned at Ruwais Hydro Cracker Plant Flare Gas System in July 2008. The project was jointly funded by TAKREER and Japan Cooperation Centre, Petroleum (JCCP). The project was completed in collaboration with Japanese companies i.e. Cosmo Oil, Cosmo Engineering & Toyo Engineering.

07 ADNOC News July / August 2010

TAKREER NEWS

FLARE GAS RECOVERY PROJECT PHASE I COMMISSIONED AT RRD

Project hailed for protecting the environment and reducing operations cost

In a massive step to protect the environment and reduce operations cost, the Phase 1 of the Flare Gas Recovery Project has been recently commissioned at Ruwais Refinery Division (RRD).

The cost of the project is around $16 million.

Under the project, a flare gas recovery system is installed to protect the environment and reduce operations cost by using recovered gas as fuel for heaters, boilers and other equipment. Hence, it recovers the excess gas that goes to the flare and burnt in the atmosphere and causes environment pollution as well as loss of valuable hydrocarbon.

Japan Cooperation Centre, Petroleum (JCCP) has participated in establishing the project, COSMO Oil Co. Ltd provided required support for the project while engineering, procurement and construction was carried out by the EPC contractor M/S Toyo Engineering.

The Project MOA was signed with JCCP in 2005. After carrying out detailed engineering, procurement and construction carried out by the EPC contractor M/S Toyo Engineering, the plant was commissioned in 2008.

It is worth mentioning that Takreer imposes strict control on environment protection in line with ADNOC guidelines on waste discharge or release. However, "ADNOC" control limit of emission discharge of Sulphur Di-Oxide (SO_2) into air is 150 mg-SO_2/NM_3 of dry flue gas.

The FGR unit recovers 1050 NM_3/Hr of flared gas and uses the-state-of-art technology. The work horse of the

Flare Gas Recovery System (FGRS) is a special Liquid-Ring Compressor which is very reliable and maintenance free.

The recovery of the excess gas from the flare header is beneficial to the refinery for the following reasons:

1- Minimize flaring (i.e. flaring gas that is released from flare stack should always be minimum) to control the emission of SO_2 & CO_2.

2- The emission of Sulphur as Sulphur Di-Oxide is reduced as the recovered gas is treated and made sweet and sent back to the refinery fuel gas header.

3- The valuable hydrocarbon is recovered and put to use as fuel gas. This reduces not only flaring but also natural gas consumption as fuel component.

The primary purpose of the flare is to burn off hydrocarbons that might be released due to normal operation or plant upset; it must be constantly on (when an upset occurs, there is simply not enough time to go out and light the flare). Thus all refinery flares burn constantly. This is achieved by running a small pipeline parallel to the header using small quantity of fuel gas which must be lit always to ensure burning of released gases through the flare stack at all times.

To have a final wrap-up on the project, a meeting was held at Takreer HQ on 3rd March followed by site visit to Ruwais Refinery on 4th March. Total of 11 delegates from JCCP, COSMO Oil, COSMO Engineering and from Toyo Engineering participated in the meeting. Takreer side was headed by BSDM.

COSMO Oil presented their findings based on the test run conducted in July 2008 followed by supplement data provided in October 2008. The project is estimated to reduce 1800 Tons/year of Carbon Di-oxide (CO_2) and Sulphur Oxides (SOx). The delegates later visited Flare Gas Recovery Plant at Ruwais Refinery and expressed satisfaction on functioning of the plant.

8. Project Result - 3

This project wins The Japan Petroleum Institute 's Award for International cooperation.
This news is also covered the Japanese newspapers.

コスモ石油

石油学会 国際技術賞を受賞

UAEでのフレアーガス削減技術

コスモ石油は、アブダビ石油精製会社製油所で、国際石油交流センターの産油国基盤整備補助事業の一環として、フレアーガス削減を目的にフレアーガス回収設備の技術導入を実施しているが、フレアーガス削減技術による産油国への貢献が高く評価され、石油学会国際技術交流賞を受賞した。

この技術は、従来フレアースタックとして処理していたガスを燃料として有効利用できるため、設備導入を08年10月に実施した。この技術により年間約7000トンの二酸化炭素の排出削減が可能となる。

今回の技術は、新設設備と既設設備の干渉を打ち消すため、運転制御の解析を行い、計装システムを改めることで安定化を実現した。また、導入設備の機器数を少なくしたことで、設備の維持管理が容易になり、長期にわたって信頼性が確保できる設備となったことで、今後の普及性が期待できる技術となった。

多数の利益に貢献することが定款に明記され、石油に限らず資源・エネル

辰巳敬

があい

小林俊和前石油学会会長より国際技術交流賞を受賞したアブダビ石油精製会社のFareed Mohamed Al Jaberi氏に記念品が贈られた

石油学会国際技術交流賞を受賞

コスモ石油 産油国への貢献が評価

9. Finally

We not only achieved through this environmental project, we were able to build a good relationship. We will continue the good relationship as partners in the future.