The Gas Processors Association GCC Chapter organized their 25th Annual Technical Conference in Abu Dhabi (May 2017) under the patronage of H.E. Suhail Mohamed Al-Mazrouei, Minister of Oil of Abu Dhabi who inaugurated the event and was also the keynote speaker at the Conference. The theme of the conference was ‘Achieving Efficient and High Performance Gas Processing’.

KEYNOTE SPEECHES

H.E. Suhail Mohamed Al-Mazrouei
Minister of Energy
Abu Dhabi, UAE

Mr. Ahmed A. Al-Ghamdi
GPA-GCC Chapter Chairman

Mr. Omar Suwainah Al-Suwaidi
Gas Management Director
ADNOC

THANK YOU

GPA-GCC Chapter wish to extend their sincere appreciation to ADNOC for supporting as a Platinum Sponsor of the 25th Annual Technical Conference in Abu Dhabi in 2017.
Mr. Ahmed Ghuloom (GPIC, Bahrain)
Best Paper 2017 was awarded to

- Mr. K.S.Sabapathi / Mr. Karthik Rajagopalan (KNPC) : “Innovation and Challenges in LPG Train-4 commissioning”
- Mr. Ahmad Ibrahim Ahmad Al-Baghli (KNPC) : “Experience with Optimizing Steam to Gas Ratio in Steam Methane Reforming Hydrogen Unit Mina Abdulla Refinery”

The award was received by Ms. Wadha Al-Khateeb and Ms. Ahmed Al-Own from KNPC.
Mr. Inshan S. Mohamed & Mr. Egbert Van Hoorn were the instructors for workshop on Design Challenges & Opportunities in Sour Gas Operations which was held at St. Regis Abu Dhabi from 7th—8th May 2017.

Gas Sweetening and Troubleshooting Workshop

Mr. Kefah Al-Faddagh was the instructor for workshop on Gas Sweetening and Troubleshooting which was held at St. Regis Abu Dhabi from 7th—8th May 2017.

Filtration and Separation Workshop

The PECOFacet team held a workshop on Filtration and Separation from 7th—8th May 2017 during which they had a practical workshop which was open for all participants from other workshops.
Feasibility Study and Debottlenecking To Increase IGD Dehydration Units
Mariam Ali AlHosani-ADGAS

The paper presented in details the study done by ADGAS to explore the possibility to increase the Integrated Gas Development (IGD) plants from existing 900 MMSCFD to 1200 MMSCFD. The bottleneck was found to be the Gas dehydrations Units (GDUs) as the only unit which was designed for 900 MMSCD while the rest were designed for 1200 MMSCFD. ADGAS has explored the possibility of increasing the load of each of the GDU to 320, 335, 350 and 400 MMscfd to cater for additional gas needs by the emirate of Abu Dhabi while maintaining the constraints such as moisture content. Adequacy assessments were performed to increase the dehydration processing capacity from 300 MMscfd to 400 MMscfd; in steps, without imposing major modifications on the units.

- Case 320-335 MMSCFD, it was found feasible and require no modifications.
- Case 350 MMscfd, the same was achievable provided that the TEG internals of the contactor to be modified
- Case of 400 MMscfd was found to be unfeasible as the dry water content specification of 2 lbs/MMscf could not be met with

The Kingdom’s Master Gas System (MGS)
Ismail A. Alami-Saudi Aramco

The Master Gas System (MGS) in the Kingdom of Saudi Arabia was initiated in 1975 with a processing capacity of 3.5BSCFD and a cost exceeding 10 billion dollars. Finding additional gas reserves is one of the current Saudi Aramco’s top priorities to meet the kingdom’s growing demand for energy and avoid liquid fuel burning which is not only economically unattractive option, but cause more negative environmental impacts. The commissioning of the MGS was not only a huge step forward in the Kingdom of Saudi Arabia economy, it also represented a major environmental protection event when all flared gas converted to a clean fuel for local industry.

In this presentation, a historical overview of the major gas processing programs and the establishment of the local gas market will be presented. We will also shed some lights on the enormous gas pipeline network which deliver the gas to the customers over extended geographical area within the kingdom. The representation will be concluded by a look at major future expansions of both gas processing capacity and pipelines network

Installing the DPDU for Dew Pointing of Rich Gas
Eisa Abdulla Al-Haddad -KOC

It is a well-known fact that for generation of electrical power, lean fuel gas is ideal amongst Hydrocarbon fuels, as it is more efficient, easy to handle and relatively cleaner fuel. Other fuels with higher calorific values are more expensive, polluting and not so easy to handle. Kuwait Oil Company, the energy provider for KUWAIT is engaged in supplying Lean Fuel Gas to Power stations after extracting heavier components from the gas for production of LPG and other products at KNPC refinery. Nevertheless, when the LPG plant goes under shut down either for annual planned maintenance or due to any unforeseen reasons, Lean fuel gas supply is not available and the power stations have to use rich gas and/or liquid fuels for generating thermal power. Rich fuel gas has the tendency of slug formation in the
Major Energy Saving Initiatives in one of GASCO plants in 2016
Ahmed Saleh - GASCO

This presentation will technically discuss the Energy Efficiency initiatives taken in 2016 in one of the Largest NGL Producing Plants in the UAE (GASCO-BuHasa). The presentation will focus on four major Energy Saving initiatives.

- **C3+ ENHANCEMENT AND INCREASING NGL PRODUCTION BY 20-30 TONNES PER DAY** (11,500 tonnes of NGL increase per year, equates to around 2.8 MM US$)
- **FLARE REDUCTION BY UTILIZING 36” HP LINE FOR RESIDUE GAS** (Extra RG recovery of 6,265 MMSCF/year Actual 13.30 MM US$)
- **SAVINGS THROUGH INTERNAL & EXTERNAL LEAK SURVEY** (5.14 MMSCF/Year. Energy Savings in 2016 equates to ~ 0.014 MM US$)
- **SAVINGS THROUGH ADVANCED PROCESS CONTROL (APC) TUNING AND REVAMPING PROJECT** (214 MMSCF/Year Energy Savings in 2016 equates to ~ 0.55 MM US$)

Optimum Solution to High Vibration in Incinerators
Khoula Al Mashjari, Ashok Sharma - GASCO

High vibrations were observed in the superheater region of all four SRU incinerator packages recently commissioned in GASCO plant which could lead to integrity and operation issues of the unit. Some damage to refractory, insulation and nozzle welds were also noted. This paper presents a state of the art analysis and approach followed to not only identify the root cause but also provide solutions to mitigate the vibration. This posed a challenge, as unlike rotating equipment/piping, no industry standard defines acceptable vibration for static-equipment. Specialized CFD and thermo-acoustic analysis for numerous operating cases were performed to address this complex combustion issue. Analysis concluded that vortices are formed in the burner region due to improper mixing of combustion gases which created pressure fluctuations causing vibrations at frequencies correlating with field measurements. FEA and fatigue analysis indicated potential premature nozzle failures in the superheater region. Several options to eliminate the root cause were explored and provision of a choke ring inside the incinerator was identified as optimum solution ($1.2M) instead of a burner replacement ($4M). To “Deliver More for Less” alternate solution of installation of a stiffener-ring ($80K) in the super-heater region is recommended to change the natural frequency and reduce the vibration to acceptable limits.
A Methodical Approach to Identify an Optimal Solution for Elemental Sulfur Deposition in Sour Gas Systems
Megat A. Rithauddeen-Saudi Aramco

The Wasit Gas Plant (WGP) project is the latest gas increment executed by Saudi Aramco to expand the Kingdom’s Master Gas System (MGS). It provides grassroots facilities for processing 2,500 MMscfd of sales gas produced from two nonassociated offshore gas fields. Initial analyses indicated the presence of elemental sulfur in wellbore gas samples obtained from one of the fields, leading to high concerns related to flow assurance and corrosion in the offshore gas production and subsea transportation facilities. This paper will discuss and present Saudi Aramco’s methodical approach to mitigating the impacts of this unique design challenge upon startup of the gas field. It includes a description of analysis to quantify the expected level of elemental sulfur in the sour gas, decision tree analysis to install the right type of treatment system, and tests conducted to verify the conclusions. Through a systematic approach it was determined that the actual elemental sulfur content was well below the expected level that requires full-time treatment. Following the shutdown of the existing treatment facilities, significant annual operating expenditure savings were achieved.

Alternative Strategy for SRU Control
Fawaz Al-Qattan-KNPC

The Mina Al-Ahmadi AGRP is a gas sweetening facility designed to treat 230 MMSCFD of sour gas at 2.5% H2S and 8% CO2. The recovered acid gases are passed through an AGE-SRU-SCOT unit loop in order to convert 99.9% of H2S into sulfur. Since its commissioning in 2003, the TGT have been experiencing multiple issues that prevented its smooth and continuous running:

- Soot formation from SCOT line burner
- Instability of reactor temperatures either due to oxygen ingress or unstable SRU control.

The TGT unit was successfully kept in operation for nearly seven months for the first time in 2013/2014. However, in 2015, the outdated air demand analyzers failed thus preventing continuous operation. Despite a replacement project being in progress, the replacement could not be done in time. Running the Tail gas unit without proper control was not an option.

What Has Your Sulphur Plant Done for You Lately?
Angie Slavens-UniverSUL Consulting, Onur Kirpici – ADGAS

The paper reviewed the energy benefits of various sulphur recovery technologies and presented benchmark energy KPIs for each. As a case study, for ADGAS Sulphur Recovery Unit 3 energy KPIs were compared to benchmark key performance indicators (KPIs). This helped as guidance to operators on how their sulphur recovery facilities should be performing, from an energy efficiency perspective. Possible options for improving energy efficiency were investigated. Recommendations were made to operating parameters such as reactor dew point approach and incinerator stack excess oxygen. Energy benefits to the overall processing facility were also explored with recommended hardware changes.
Alternative Solution to Handling Sulphur Processing Capacity Increase
Martin Lebel-SHELL

Environmental regulations around fuel sulphur content, refinery sulphur emissions and MARPOL conventions have become stricter over the past decade. These lead to increased residue upgrading, implementation of Euro V specifications and new sulphur recovery efficiency targets which all have had or will have a significant impact on the sulphur recovery unit designs, operation and overall refinery sulphur balance. To cope with all these changes, incremental modifications have been performed over time to extend the life of sulphur plants, sometimes stretching capacities to almost double the initial design figures. Environmental agencies have also in some instances pushed change by forcing refiners to have redundant sulphur recovery trains. The changes in sulphur processing requirements have mostly been addressed by either added physical capacity or by processing less inert gas in the SRU through oxygen enrichment. An alternative solution that has not been considered more frequently is the processing of concentrated SO2 gas in the SRU, displacing some of the air demand while simultaneously reducing high temperature excursions in Claus reaction furnaces. The inclusion of a regenerable SO2 tail gas treatment unit produces the required pure SO2 stream and provides an added lever for operators to maximize debottlenecking by bypassing some of the acid gas to the tail gas incinerator and recycling additional SO2.

Utilization of Dispersion Modeling for Flammable Gas Detection System Design
Jassim Al-Saegh- Banagas

The objective of flammable gas detection system is to provide early warning to personnel in the facility whenever hazardous gas release occurred.

The two process trains of Banagas Central Gas Plant were covered with 14 flammable gas detectors. In the LPG storage area, it was observed that some of the existing gas detectors are located upwind of the LPG spheres, which means that in the event of flammable gas being release, the arrangement may not readily and effectively detect the leak. Accordingly, to properly review the quantity and locations of flammable gas detectors, Banagas performed a comprehensive flammable gas detection study for its central gas plant adapting dispersion model simulation.

The study which was completed in January 2015 concluded that 53 new detectors need to be provided and 9 of the existing detectors need to be relocated.

LOPCs in OLNG
Mohammed Al Kalbani-OMAN LNG

In 2015, Oman LNG LLC (OLNG) experienced a 72% increase in the number of Loss of Primary Containment (LOPC) incidents compared to the previous year, most of which (57%) occurred immediately after Train startups and shutdowns. This led to the declaration of war against leaks and the development of the “LOPC Reduction Plan”, an initiative aimed to diminish hydrocarbon leaks and gain a sound understanding of their causes. The main three causes for leaks, accounting for over 50% of the total, were found to be competence, improper maintenance, and material degradation. Oman LNG is currently on its second year of implementing the LOPC Reduction Plan; thus far this has resulted in zero Tier 1 and Tier 2 LOPC incidents in the year 2016.
**APC Implementation on ADGAS LNG Train 3**
Chetan Chougale-ADGAS

ADGAS has implemented Advanced Process Control Solution (APC) for LNG Plant with intent to Increase throughput while respecting all constraints required for ensuring integrity and reliability of its assets. Model based predictive control used in implementation of APC is not so uncommon in industry today, however, innovative solutions that were used for

- Mixed refrigerant composition control
- Solution to control impact of batch operation of gas driers on continuous Cryogenic exchanger control
- Three layer implementation of inferential to improve its robustness

Has made APC implementation at ADGAS unique. The above initiatives has substantially reduced operator actions by more than 70% and speaking financially, its implementation has resulted in payback of less than 6 months.

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**Impacts of Dense Phase Flow on Pipeline Capacity**
Fatima Al Raeesi, Nouf A I Kaabi-GASCO

In view of ADNOC’s vision towards optimization, efficiency and profitability, GASCO along with its Operating Companies is committed to ensure process design optimization. In line with this a project was implemented using an existing pipeline to accommodate the additional feed gas coming from offshore production facilities. A 30-inch dense phase pipeline is originally designed to accommodate a normal capacity of 200 MMSCFD Feed Gas with an operating pressure of 148-97 barg (varies based on transported gas composition). The design capacity of this pipeline is 530 MMSCFD. The feed gas supplements the LP gas already being delivered through the OAG facilities and this brings the total of LP OAG and HP Integrated Gas Development (IGD) gases to 1000 MMSCFD.

Several studies were conducted such as dense phase pipeline transient hydraulic analysis to ensure the pipeline’s ability to handle the additional capacity running at 207km long. Additional capacity can be handled in the existing 30-inch pipeline in terms of operational modification within the operating envelope. The limited design capacity was overcome by increasing the operating pressure in order to achieve the dense phase region and the new capacity.

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**Ejector Technology for Efficient and Cost Effective Flare Gas Recovery**
Trevor Leagas, Greg V. Seefeldt-Zeeco Inc

Flare systems are a common sight in the GCC region at oil and gas production, processing, and refining facilities. They offer a safe and reliable method for burning gases during emergency release cases. While flares will always be needed for these emergency cases, the last decade has seen a stronger push to reduce flaring rates during normal, non-emergency conditions by adding Flare Gas Recovery (FGR) systems. The main goals are to increase efficiency of the facility and reduce air emissions. This paper discusses using Ejectors for FGR systems. While Ejector technology has been utilized for many years in other services, the concept of utilizing it for Flare Gas Recovery is relatively new. A variety of compressor technologies have
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Novel Sorbent Technology for the Removal Of Ionic Mercury From Aqueous Streams on Gas Processing Plants & Refineries
Panayiotis Theophanous-Johnson Matthey

Johnson Matthey have devised a new fixed bed sorbent which can be used for the removal of ionic mercury from aqueous streams. This paper gives an in depth analysis on the chemistry, product development, optimisation and scale up of the product as well as the suitability of this novel technology for use on Oil & Gas facilities. JM have carried out lab and field trials using the product and the presentation will give some insights in to the performance of the material under varying operating conditions. We will also discuss in more detail the applicability of this technology for other water streams where mercury is an issue, including waste water from goldmines.

Efficiency Enhancement vs Single-Mindedness
Sulaiman Saleh Mohammad Asker-GASCO

One of the potential causes of opportunity losses and lower efficiency in plant operation is the slow or late human intervention and single-mindedness of the panel operator. One of the attribute is that of “Calculating some process parameter ratios for adjusting the process”. To avoid or minimize such distractions we have implemented some automated calculation models which takes inputs from other stand-alone systems to do the required calculations and give the output values dynamically on designated locations on DCS pages. With this calculation model, it will minimize the distraction due to single-mindedness of the Panel Operator, it will avoid manual calculations. Instead, the panel operator uses these output values directly for controlling the process parameters. Some examples of such calculation model implemented in our plant on DCS are:

- Rich Amine Loading value to guide the panel operator on how to adjust the amine regeneration process parameters.
- Energy Performance Indicators (EnPIs) of all significant energy users in the plant on a separate DCS page in green or red color based on the pre-defined limits.
- Cold Box differential temperature in NGL refrigeration system to show the cooling performance of the unit.

Wasit Gas Plant Success Story of Foaming Management
Ibrahim J. Al-Zahrani-Saudi Aramco

Wasit Gas Plant (WGP) is a grass root gas handling and processing facilities designed to process 2.5 BSCFD of sour gas from Arabiyah and Hasbah non-associated fields to produce 1.75 BSCFD of Sales Gas and 4200 MTD of liquid Sulfur. WGP has four identical Gas Sweetening & Dehydration trains with a capacity of 665 MMSCFD each. The objective of the Acid Gas Removal (AGR) Unit is to remove H2S and CO2 from the sour feed gas received through the Inlet Feed Separators, delivering sweet gas to the Master Gas System and acid gas of a suitable composition to the Sulfur Recovery unit (SRU). AGR is utilizing Sulfinol-M process amine solvent for acid gas removal. The wet sweet gas from AGR unit it is further processed at the TEG dehydration train to achieve sales gas water specification. The product sales gas specification is <1000
A stitch in time saves nine is a well known proverb which means that timely action very often saves a great loss. This paper discusses how various aspect of business for an operating company can be improved by employing the principle of “Catch Them Early”. This means that early identification of the pitfalls, risks and threats for various business processes leads to better profitability for an operating asset. All the business processes can get assisted by application of this principle ranging from project Implementation, plant operation, and maintenance to manpower planning etc.

Various techniques are available and employed for planning, scheduling and controlling various business processes and activities. For example, every company these days employs practices to manage projects without any time or cost overruns. However, we still see many projects that are not completed in time or are completed at much higher costs than originally planned. This sometimes affects the profitability of the project and in some cases the relevance of the project itself becomes questionable. A review of such projects reveals that in most cases, major aspects are covered while formulating the project and are very well defined. However, the smaller issues are some time ignored considering that these aspects will anyway fall in place when the details will be worked out. This paper discusses the techniques and procedures that can help in foreseeing the issues that may become critical in project implementation.

Another important aspect for any operating plant is maintenance and each operating company follows one or the other strategy for its plant maintenance. However, there are still some common practices that can be applied to envisage maintenance needs early enough to allow proper planning and scheduling and reducing “Fire Fighting”.

Successful Implementation of Flare Gas Recovery Systems in Gasco Plants, Jagannathrao Allamaraju-GASC

A study was conducted on Hydrocarbon Flares of Gasco Plants A, B and C in order to predict the various continuous flow rates through the three Hydrocarbon Flare headers. It was predicted that for each of above plants the recovered gas could be in the order of ~1 to 2 MMscfd.

In FEED, considering the future additional flare gases, the design capacity of the individual flare gas recovery systems fixed at 5 MMscfd per train for each of above plants. EPC Package was developed to execute project on turnkey basis.

Project demonstrates tangible and proven benefits to minimize continuous flaring with an operational track record for over past three years on continuous basis.

Our experience has demonstrated that the methodology used offers a reliable means to recover hydrocarbon gases over wide range of gas compositions without affecting the existing facilities.
Enhancing Operational Excellence of Remote Fiscal FlowMetering Systems Using Current Digital Technologies Bharadwaja Prabhala-BAPCO

The fiscal metering and monitoring of gas in a Gas Distribution Network has always been challenging in the remote locations where no independent utilities are available. With the challenges of the current Oil & Gas market scenario, dwindling production margins and insurance regulatory compliances, it has become more imperative to reduce the CAPEX, operational cost and focus on unaccountable losses without compromising safety. This paper discusses a novel concept of unifying and integrating new technologies, improving the data management, carrying out energy audit, fortifying the utilities and introducing a SIL rated safety system to enhance the operational excellence of the metering system. The technologies used are Hybrid solar power systems, wireless devices, high speed and seamless data communications and self-contained hydraulic safety systems. These technologies have already been tested and independently evaluated earlier and the package concept of plug and play and standardization is estimated to benefit through reduced CAPEX, maintenance, mean time to repair and enhance safety, availability, performance, visibility and diagnostics.

Linear Programming (LP) Model For Gas Plant Muhammad Asif-Al Hosn Gas

Al-Hosn Gas Plant is designed to process 1,000 MMSCFD of highly sour well head gas and produces five products i.e. Sales Gas, NGL, Condensate and Granulated Sulphur. Gas plant consists of two condensate processing trains, four acid gas removal units, four Sulphur removal trains and two NGL recovery units. There are 32 wells supplying feed to the plant. Each well has got different compositions with minor variations leading to different yield. Also depending upon market price and operating cost each of products has got different profit margins. Hence there was a need to have an efficient tool to define the optimum flow rate from each of the well to maximize overall profit at all the time with respect to change in market prices or availability of one or more processing units due to maintenance. HYSYS modeling was used to define the product yields for each well composition. Using these yield numbers, profit index (profit in $/MMSCF of well gas) for each well was calculated. Linear programming ((LP) model was developed to maximize the total profit from all products with variables as Individual flow rates from all 32 wells and defined constraints e.g. flow limits from each well, transfer lines capacity limitations, gas processing units capacity limitations, etc. Model predicted an incremental profit of 2.5 % by optimizing flow rates from individual wells. During preventive and corrective maintenance of individual units, this incremental profit can go up to 5.0%. Model also predicts limiting constraint and available spare capacity of individuals units for each set of conditions.

Optimizing Operating Envelope To Maximize NGL Recovery Mariam Al Ali, Praveen Hakki-GASCO

In line with ADNOC’s vision on improving performance, optimizing efficiency, and increasing profitability, GASCO conducted an in-house technical feasibility study to evaluate the possibility of increasing discharge pressure of the HP compressor by 1 bar over the current operating pressure within existing design envelope. This will lead to an enhance in efficiency by increasing C3+ recovery leading to increase in NGL production and thus maximize profitability.

By implementing 1 bar increase and safely utilizing the available design margins of the equipment, the following cost benefits were realized during Test Run:

- C3+ Recovery increased by 0.2 wt.%, equivalent to 35 Ton/day NGL.
- Revenues increased by 2.8 MM USS/year while Operating cost increased by 220000 US$/year
6th - 8th March 2018, Shangri La Hotel, Sultanate of Oman

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