NEW FOCUS 2002

DECEMBER 2002

ANNUAL NEWSLETTER OF THE GAS PROCESSORS ASSOCIATION - GULF CO-OPERATION COUNCIL CHAPTER

A REVIEW OF THE 10TH TECHNICAL CONFERENCE

In his opening address, the Chapter Chairman, Dr. Shaikh Mohammed Bin Khalifa Al-Khalifa, welcomed delegates to the conference, which was held in the State of Qatar, extending his thanks to the Qatar Petroleum Corporation for their full cooperation and assistance in supporting the conference. The Chapter Chairman also extended his thanks to the Board members of the Chapter and members of the Technical Committee for their support and contribution towards the Chapter.

Dr. Shaikh Mohammed presented a brief overview of developments in the gas industry and spoke about the growing demand for gas worldwide. He said that global demand for gas continues to grow strongly at 2.7 percent annually according to the International Energy Agency (IEA), while natural gas gained further market share, estimated to be around 24% of total primary energy consumption. Global gas reserves are estimated at 5782 trillion cubic feet, of which the Middle East represents 70 percent. He pointed out that total gas production in the Arab States amounted to 740 trillion cubic feet, 12.8 percent of world production.

He added "the GCC countries themselves have total estimated proven gas reserves of 925 trillion cubic feet, 16% share of the world's major gas reserves. Qatar alone accounts for 7% of the world's proven reserves and is placed third after Russia and Iran, followed by Saudi Arabia and UAE with demand for electricity and water in the region growing an average 14 percent a year with gas-powered plants providing these services.

Shaikh Mohammed emphasized that all the investments in the gas industry tell us that there are 5 main areas, we, the people working in the gas industry, should focus on to achieve efficiency and effectiveness, and that will contribute to high standards of performance in our industry. These are :-

- ***Adopt new technology and ensure its fitness for purpose and proven reliability.***
- ***Develop a highly skilled workforce and provide the appropriate training and coaching.***
- ***Sustain safe and secure operational practices.***
- ***Protect the environment in all aspects of plant operation.***
- ***Promote interaction and exchange of knowledge and experience for the well being of our industry.***

In his closing remarks Dr. Shaikh Mohammed also emphasized the objectives and role of the Chapter which is to act as a forum serving the gas processing industry, to exchange ideas and information and to learn from the experience of our colleagues in the industry. He wished the delegates a very successful and enjoyable conference.

MR. AL-JAIDAH

ADDRESSES THE CONFERENCE

Mr. Nasser Al-Jaidah, Director of Oil and Gas Ventures for Qatar Petroleum, gave the keynote speech and in his presentation highlighted the worldwide prospects for gas, for Arab gas and finally Qatari gas.

Mr. Al-Jaidah pointed out that projections indicate robust and sustained growth for gas with the prospects for gas demand very bright. He explained gas remains the fastest growing primary energy source with demand projected to double between 1999 and 2020 reaching 162 TCF in 2020, while the gas share of total energy consumption is projected to increase from 23% in 1999 to 28% in 2020.

He added that about 50% of the gas will be used in power generation with the strongest growth expected in developing countries, with an average growth of 5.2% per year compared to 2.7% for oil and 3.1% for coal.

Mr. Al-Jaidah also showed that the main key drivers for growth in gas demand are: Improvement in technologies for power generation; the Kyoto agreement on reducing Co_2 emissions; worldwide gas market deregulation; lack of adequate gas supplies in major market areas; cost reduction of LNG plants and transportation and prospect of Gas-to-liquid (GTL) as a viable method of gas utilization.

Mr. Al-Jaidah also shed light on the prospects for Arab gas, explaining the characterization of Arab gas, reserves utilization and markets. He went on to explain the factors that attributed to the limitations of gas production and export in the Middle East countries.

With regard to Qatar gas export prospects, Mr. Al-Jaidah provided a brief background of the Qatari gas industry with an explanation of the gas prospects from the North Field, which is considered the biggest single non-associated gas field in the world. He also highlighted the strategy and objectives of the Qatar gas industry which are: Firstly, to satisfy local demand for gas (i.e. Power generation and desalination) and to establish Qatar as a major international Hub for gas based petrochemicals industries. Secondly, to enhance Qatar's position as a major player and exporter in the world gas industry through diversification (i.e. LNG, pipeline and Gas-to-liquid conversion).

Evaluation of Transportation Capacity of Sub-Sea Natural Gas Pipelines Under Changed Operating Conditions: Some Design Aspects

A. Bhattacharya
Qatar Petroleum

Dynamic operating conditions in offshore fields have a potential impact on the operation of sub-sea pipelines carrying hydrocarbon from these fields to the downstream terminals.

Natural gas transportation from offshore fields through sub-sea pipelines to the shore terminal represents an important segment of the offshore Oil & Gas Industry. Natural gas from offshore wells normally contains impurities like water, solids (sands) and liquid hydrocarbons (natural gas liquids and crude oil), all of which are usually removed or processed to some extent at the offshore complex to make the gas suitable for transportation by pipelines. Offshore gas is usually termed as "rich gas" because of its high content of natural gas liquids (NGL).

For a sub-sea gas pipeline to operate in the vapor phase, natural gas streams from well heads have to be treated to have a dew point below the lowest expected operating temperature to minimize condensate dropout during transportation.

Dense phase gas pipelines are much less sensitive to operational variations over the field life, compared to two-phase pipelines. However a distinct disadvantage for dense phase transportation exists should there be a need for depressurization of the pipeline to occur. As the pipeline pressure drops, liquid is formed and the operating mode will become two-phase. This aspect must be studied and considered for evaluating the best operating procedure and for sizing of the downstream slug catcher and other liquid handling facilities. Often complicated operational procedures are employed for start-up and blow-down of the system in this mode of operation.

There could be many operating scenarios under which the transportation capacity of an existing sub-sea pipeline may require re-evaluation. As a result of any one or combination of these scenarios, the operating mode of an existing sub-sea pipeline may change.

Normally the heavier fractions in a natural gas stream are denoted as C6+ or C7+. The fraction normally contains a mixture of compounds and frequently is the determining factor in fixing the dew point of the gas. Liquid formation in a natural gas pipeline changes the line pressure drop and flow characteristics. A seemingly inconsequential amount of liquid can cause significant changes in line pressure drop and capacity. Moreover detailed information on the fraction is required for predicting gas dew point and trace liquid formation.

The Equation-of-State (EOS) approach has been widely accepted as the preferred mode for modeling of phase behavior in gas pipelines. One of the great advantages offered by this approach is the estimation of liquid formation at any point in the gas pipeline, whether operating in single-phase, dense phase or two-phase mode. However for employing a suitable EOS, physical parameters like critical pressure/temperature and eccentric factors are required.

The next step is to employ a suitable EOS. Three widely used EOS that work reasonably well near the dew point and for both liquid and gases are: SRK, PR and BWRS. In addition to covering a wide range of conditions, these EOS can also be expressed in generalized form with mixing rules that permit the calculation of coefficients for different compositions. SRK and PR are called cubic EOS while BWRS adds even higher order (fifth and sixth) for density calculations.

It is therefore imperative that proper characterization of gases being transported and choice of suitable EOS play a crucial role in determining pipeline capacity.

In practice, a single phase gas stream in a pipeline often changes to two-phase system and may again re-enter single phase as it traverses along the pipeline. Commonly used two-phase models do not have phase-transition capability and cannot integrate single and two-phase flows in one model.

Inadequate and sometimes over-simplified approaches undertaken for analyzing sub-sea gas/gas-condensate pipelines failed to predict real life behavior. These may affect cost-effective operations and may have some serious commercial implications.

TWISTER SUPERSONIC GAS CONDITIONING

FRED T.OKIMOTO AND SALIM SIBANI, TWISTER B.V.

Fred T. Okimoto and Salim Sibani, presented a paper discussing gas processing at supersonic speed by using Twister TM technology.

The basic concept of this technology is that gas is expanded in a Laval Nozzle to supersonic speed resulting in lower temperature. Nucleation of water and hydrocarbon droplets occurs followed by droplet growth. These droplets come in contact with a wing where a very high swirl is created and the droplets are centrifuged onto the walls, then the gas and liquids are separated and the pressure in the diffuser is recovered to about 70-80 % of the initial pressure. All this is done without chemicals or rotating equipment, requiring minimum space and weight, thus saving significant capital and operating costs.

The principle underlining the Twister technology is to convert energy from expansion into higher velocity. Increase in velocity results in lower pressure and temperature, and this cools the gas causing water and hydrocarbon to condense. Liquids are then separated from the gas. Finally, pressure is recovered to about 70-80 % of the inlet pressure. In addition it is important to note that Twister works at any pressure level. Twister is a pressure ratio device, so it's principles apply at 1000 psig, 10 psig or whatever pressure as long as the necessary pressure drop is available.

This new technology applies a portion of the First Law of Thermodynamics that is different from what is normally used in gas process. Instead of shaft work, Twister uses kinetic energy, i.e. velocity. So instead of shaft work from the system as in the case of a turbo-expander, there is increased velocity. Velocity increases and becomes supersonic. This is the unique concept of the Twister TM Supersonic Separator.

Mainly Twister TM Supersonic Separator is combination of a turbo-expander, a gas / liquid separator and a re-compressor.

There are many potential Twister applications (dehydration, dew point, C5+, LPG, C2, LNG, CO_2 / H_2S, subsea applications, etc.), but the technology development is currently focused on markets for Gas Dehydration (water dew point), Hydrocarbon dew point and C5+ recovery.

In summary, Twister TM Supersonic Separator is a very innovative gas processing solution for surface gas conditioning for offshore, and in the future it will be innovative and unique gas processing solution for subsea.

C3/C4 RECYCLE LINES

NASSER S. ALZEREA
SAUDI ARABIAN OIL COMPANY

The paper presented by Nasser S. Alzerea dealt with "Propane and Butane Recycle Piping Modifications At Ju'aymah Gas Plant".

The aim of this project was to maintain the treating section above the minimum hydrocarbon flow (turndown ratio) for the extractors.

During periods of days and occasionally months, low incoming NGL feed rates necessitated the Depropanizer and Debutanizer columns to operate at rates 30 to 60 % below design capacity. The overhead products from these columns (propane and butane) are normally 50 to 55 % of the feed depending on the feed composition. Since these column overhead streams pass through the ADIP and MEROX treating sections and product dryers, operating during low NGL feed rates presents efficiency problems due to the minimum hydrocarbon turndown ratio limitations of the extractors in the treating unit.

In order to maintain the treating section above the minimum turndown ratio for the extractors, the plant piping was designed to allow a side stream of the final treated product to be pumped and recycled back to the columns. This effectively maintained the minimum hydrocarbon flow to the ADIP and MEROX extractors as well as the treating section efficiency. This mode of operation is designed for the depropanizer and the debutanizer columns where their overheads have to be treated to remove H_2S, COS and mercaptans.

The nature of this modification helps to shutdown big electrical motors on the transfer pumps that used to be started to elevate the recycle flow pressure to enter the columns. This is due to the fact that the reflux drums pressure is almost 10 psig lower than the column, which allows the flow to recycle by pressure.

This new modification has also eliminated the deficiency or disturbance in the column reflux controls by utilizing only one single control element to control the reflux flow to the column maintaining the reflux temperature at target.

QATARGAS SULFUR RECOVERY EXPANSION PROJECT

MOHAMED AL KHALDY & STEVE SUMMERS, QATARGAS

Mohamed Al Khaldy and Steve Summers presented a paper describing the low sulfur recovery problems and operating difficulties in the sulfur recovery facilities due to the variation between design and actual values of H2S content in the acid gas feed.

A study was undertaken to develop options for improving the sulfur recovery. The process options were evaluated to ensure target sulfur recovery efficiencies were met and to debottleneck the SRUs (Sulfur Recovery Units) to handle acid gas from three debottlenecked LNG trains. The options included a third SRU similar to the existing two units, activated carbon acid treating, oxygen enrichment, acid gas compression and re-injection, and AGE (acid gas enrichment). Out of the five evaluated technologies only AGE provided a feasible option to meet the project objectives. ExxonMobil's Flexorb® SE hindered amine was selected for use in the AGE units due to favorable economics and performance over promoted MDEA solvents. Two identical AGE units will be installed at Qatargas to process lean acid gas from three LNG trains. The resultant enriched acid gas will be processed in the two existing SRUs. The acid gas enrichment absorber overhead gas stream from each unit will be routed to a new oxidizer. Additional equipment was necessary in the SRU to make up for the high mercaptan losses from the acid gas enrichment absorber overhead gas. One additional Claus stage will be added to the existing SRUs to meet the ≥95% net overall sulfur recovery objectives.

On completion of the expansion project in the initial operations of the units proved to be very successful acid gas enrichment of 55.5% was obtained for 17% H2S content feed, the units met the design capacity, obtained an overall sulfur recovery of more than 95% and bright yellow sulfur was produced, per specification at design rates.

ELIMINATING CASTABLE REFRACTORY FOR WHB TUBESHEETS BY USING HEXAGONAL FERRULES

KHALID. I. AL - KHUDAIR, SAUDI ARABIAN OIL COMPANY.

Khalid. I. Al – Khudair spoke on eliminating castable refractory for WHB tubesheets by using hexagonal ferrules.

The paper presented the new technology of protection systems for Waste Heat Boilers (WHB) in the Sulfur Recovery Units (SRUs).

In 1997 and as part of S.A. Gas Operations new technology, a new system was introduced to the gas plants through a conference in North America. The new system is called Two Parts Hexagonal Ferrules (TPHF). This type of ferrule offers a unique solution to many of the problems encountered in the hydrocarbon processing industry. The new ferrules are simply inserted into the tubesheet and virtually eliminate the use of castable refractory or the anchors. The hexagonal ferrules allow for faster turnaround and easier maintenance.

This type of ferrule has many advantages such as no dry-out of the tubesheet refractory since the ferrules are supplied with a factory dried refractory,

Factory-controlled manufacture of the refectory, thus quality remains independent of installer skills, installation time is reduced by 90%, individual units may be removed for inspection or replacement without removing the entire tubesheet refractory and elimination of the use of stainless steel anchors.

The new system was thoroughly evaluated by the gas plant process engineers and inspectors, along with an engineer from the company Consulting Services Department / Piping and Mechanical Unit. The evaluation included conducting a thermal study by the vendor to ensure that the new ferrules would fit Saudi Aramco design and operating conditions and that they would provide the required protection for the tubesheet and the tube-sheet welds. Saudi Aramco evaluation also included some companies that are using these new ferrules and some engineering companies and vendors.

Upon completing the evaluation, the decision was made to try the new ferrules in one of the Saudi Aramco Southern Area Gas Operations (SAGO) SRUs. The installation was done on January 2001. The unit was started successfully and brought back for inspection on November of the same year. In general, the ferrules were in very good shape and have provided very good protection to the tubesheet.

IS YOUR PLATFORM CONTROL SYSTEM STRESSED?

A.J.Howell -Hyperotech

Mr. A. J. Howell of Hypertech presented a paper to determine the integrity of production facilities.

The application of transient hydraulic analysis coupled with dynamic process simulation software is, for the first time, allowing engineers and operations personnel to quickly determine the integrity of production facilities at a particular set of well, flow line and tie back conditions.

In practice, production facilities are often designed in separate stages as isolated sets of equipment items. As an example the flow lines and separation trains are often designed separate from each other. The production facilities are built from steady state computed heat and material balances, often provided by process simulation. These material balances often do not account for enough pressure drop within the system and problems can be encountered when trying to commission such facilities. The hydraulic simulation of flow lines is treated as a separate discipline and can use separate thermodynamics e.g. black oil PVT from the compositional thermodynamics of the process simulation.

In some cases a transient hydraulic simulation may be performed to check for slug flow conditions. The size of process equipment and the specification of the production process control system are then performed within a separate discipline from the correlating parameters available. Detailed design then follows. The difficult work then begins at the commissioning stage when production problems occur and a combination of wrongly sized equipment and an inflexible control system means that the only solution is to cut back on production rates. Dynamic process simulation is often only performed after the realization of production problems and is used in a trouble-shooting role. It is the design engineers responsibility to use all methods available at the design stage to ensure flow assurance, a controllable process and the integrity of the production facilities. New advances in the coupling of hydraulic and process simulation, in both steady state and transient modes, are leading to better guarantees of flow assurance and facilities integrity. In particular this approach can unify communication and education between the various departments of an operating company. This paper will examine a proposed facility design and show how performing coupled transient flow line and dynamic process simulation, early enough, can prevent significant production problems.

The general acceptance of dynamic process simulation and transient flow line analysis is now leading to new and exciting applications of the methodology across disciplines to unify models of production assets.

The dynamic process simulator uses an implicit Euler1 integration method around ordinary differential equation models of the individual unit operations at the three frequencies (volume, energy & composition). The transient flow line hydraulic simulator uses a method that conserves mass, momentum and energy for each phase around a non-conservative ill-posed, semi-implicit, first order numerical scheme.

The conventional philosophy of linking dynamic process and transient hydraulics is to have the transient hydraulics manipulate the stream properties in the dynamic process simulation and control the time step solution. The new method employed in this paper is to use the transient hydraulic simulator to submit pressure / flow equations into the dynamic process solver and solve simultaneously. The transient hydraulics then calibrates the equations in the dynamic process simulator after each time step. This new methodology results in a more robust solution, more accurate results and an increase of greater than twenty in solution time over conventional methods, ensuring a real time solution can be attained.

The integration of transient hydraulic and process dynamic simulation ensures that full studies of proposed flow line and process interactions can be studied for a proposed field development. Such studies can be performed in the early design stages when change impact is at a maximum and the committed capital expenditure at a minimum. The use of such simulation tools can dramatically improve the flow assurance, reliability and integrity of production systems.

Applications of these techniques could also easily apply to as-built systems that show the characteristics of process induced slug flow or include modifications and revamps to existing facilities.

Using these techniques one can check if the proposed production control system is stressed, if the production system promotes unstable flow or if your control system can work against you.

OPERATION ENHANCEMENT IN GAS GATHERING SYSTEMS IN SOME SAUDI ARAMCO GOSPs

HANI H. AL-KHALIFA &
A. M. AL-ABDULLATIF,
SAUDI ARAMCO

Hani H Al-Khalifa and A. M. Al-Abdullatif presented a paper discussing their experience with corrosion problems encountered in the gas gathering pipeline network and the way they overcome these problems. The corrosion occurs in the gas pipelines exiting the Gas-Oil Separation Plants (GOSPs) due to condensation, which cost the Company a lot of money on repairs.

A study, conducted in 1992, recommended changing the operation mode to two phase instead of single phase, right from the inlet to the terminus of the pipeline network. This could be achieved by injecting a 98% diesel with 2% corrosion inhibitor into the gas leaving the GOSP. The diesel is intended to saturate the gas stream, which guarantees the two phase mode operation.

However, this solution was costing a lot of money, due to the high consumption of the diesel-corrosion inhibitor mixture, which was injected in the gas. Therefore, another study was conducted in 1999, in order to minimize the chemical usage. It was found that the required amount of enhanced corrosion inhibitor is directly proportional to the gas temperature. After collecting data and making the necessary tests, the study recommended the automation of the inhibitor and diesel injection system by upgrading the existing piston pumps with an Electronic Capacity Controller (ECC). It also recommended the automation of the superheat.

The recommendations were implemented at all the 32 GOSPs in the southern area and savings of at least $900M/year were realized.

Thank you !

*The Board Members of the GPA-GCC Chapter wish to extend their thanks and appreciation to **Qatar Petroleum** for sponsoring the 10th Technical Conference.*

9th Conference Best paper

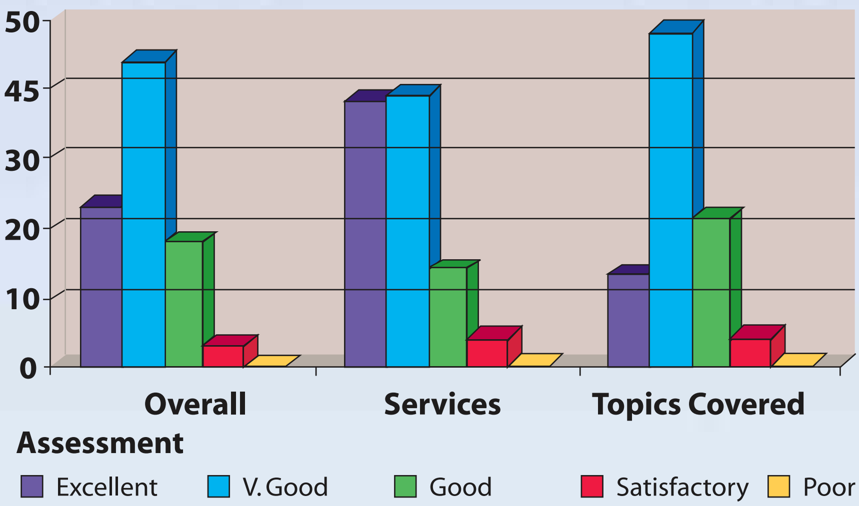
Chapter's Chairman (right) Presents a trophy to Mr. Kefah Al Faddagh

Yuv R. Mehra was selected as the best paper in 9th Tech. Conf.

A Brief Assessment of the 10th Technical Conference

The 10th Technical Conference, held on May 22, 2002 at the Doha Marriott Gulf Hotel in Qatar, was attended by over 180 delegates.

The general feedback from the delegates was very good and most papers were well received. Qatar Liquefied Gas Company representatives Mohamed Al-Khaldy and Steve Summers, were voted as the best paper at the Conference. The authors will receive their award in the forthcoming 11th Technical Conference.



SCENES FROM THE 10th TECHNICAL CONFERENCE

A Message of thanks

I want to commend you and the organizing committee for the 10th GPA-GCC conference held last week. The program was of a high quality and the organization superb. I found it very beneficial - especially the interaction with others in the industry. I really appreciate the time and effort put into making this a success. The gas industry in this area has really benefited from the GPA-GCC. Please pass my thanks along to the entire organization for their efforts over the past 10 years.

Steve Bushkuhl
General Supervisor
Upstream Process Engineering Division
Saudi Aramco

See you in

11th Technical Conference

Intercontinental Muscat

Muscat, Oman, 28th May 2003

ABOUT THE GPA - GCC CHAPTER

Some members of the Executive and Technical Committees with
Mr. Nasser Al-Jaidah, Director of Oil & Gas Ventures for Qatar Petroleum(Centre)

PURPOSE

The purpose of the GPA - GCC Chapter, formed in April 1993, is to serve as a forum for the exchange of ideas and information concerned with the gas-processing industry with a view to improving plant operations and related activities.

MEMBERSHIP

Membership in this organization is open to GCC REPRESENTATIVES OF:

(a) Companies owning and/or processing gas. These are classified as "members".

(b) GCC-based organizations involved in the supply and/or service to the gas industry. These are classified as "Associate members" and are entitled to vote on all matters in the Organization's Annual meeting except for the Executive Committee elections.

All membership applications are considered and approved by the Executive Committee.

DUES

The annual dues for Chapter membership is US$1,325, payable in advance on or before the first day of March of each year.

EXECUTIVE COMMITTEE 2000/2001

Chairman

Mohammed Bin Khalifa Al-Khalifa
Bahrain National Gas Company

Vice-Chairman

Mohammed A. Al-Abdulmoghni
Saudi Aramco

Secretary-Treasurer

Ahmed Majid
Bahrain National Gas Company

Members

Abdulrahman Al-Suwaidi
Qatar Petroleum

Salem Saeed Al-Muhairi
Abu Dhabi National Oil Company

Yousif Abdulla Yousif
Gulf Petrochemicals Industries (Bahrain)

Ali Ahmed Abdulla
BP - Sharjah

Samir Khoury
C.C.C. (Suppliers Representative)

TECHNICAL COMMITTEE 2000/2001

Company

SAUDI ARAMCO
ADNOC
BP - SHARJAH
ADCO
GPIC
BAPCO
BANAGAS

Representatives

Mohammed Al-Abdulmoghni
Kefah Al-Faddagh
Salem Saeed Al-Muhairi
Ali Ahmed Abdulla
Adel Wasfi
Yousif Abdulla Yousif
Ahmed Al-Khan
Mohammed Bu-Rashid

For more information please contact:

Ahmed Majid, Secretary - Treasurer
P.O. Box 25094, Awali, Kingdom of Bahrain
Tel.: +973-752402, Fax: +973-756991
e-mail: majid@banagas.com.bh
Web site: www.banagas.com.bh/gpa