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Syngas | Ammonia | Urea | Nitrates | Methanol | GTL | Hydrogen



# Iranian Nitrogen + Syngas 2017

25–26 November 2017 • Espinas Palace Hotel, Tehran, I.R. Iran

Organised by



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Enabling best practice and operational excellence in the Iranian nitrogen industry

## 6 great reasons to attend

- ✓ **Share** operational experience and best practice with peers
- ✓ **Expand** your knowledge with technical papers covering syngas, ammonia, urea and melamine
- ✓ **Develop** practical solutions to operational problems through detailed case studies
- ✓ **Learn** about the latest advances in technology and process that can enhance operational efficiency and improve environmental compliance
- ✓ **Address** your technical challenges with a range of world-class exhibitors
- ✓ **Understand** key market drivers shaping the industry

## Who will attend?

CRU's Iranian Nitrogen + Syngas conference is expected to attract a large audience of local Iranian and international organisations including nitrogen producers, technology and engineering suppliers, and service providers.

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CRU in collaboration with the Iran Europe Business Centre (IEBC) and IICIC are pleased to announce the inaugural Iranian Nitrogen + Syngas Conference, to be held in Tehran, Iran on 25-26 November 2017.

Iran is an important player in the global nitrogen and syngas markets due to its access to plentiful natural gas and to key demand markets. The Iranian nitrogen and syngas industry is in a period of significant development with multiple projects at both a greenfield and brownfield level.

This new regional event will draw on the success of CRU's Nitrogen + Syngas portfolio to provide a platform for peer-to-peer discussion, development of best practice; and showcasing of new technology, process and equipment developments for the improvement of production and efficiency.

The two-day agenda will feature a mix of technical papers, practical workshops and market insights. Subject areas will include ammonia, urea, methanol, syngas and nitrogen fertilizers.

Make sure you put this essential date in the diary and book now to secure your place. Don't forget that technical staff and engineers from production companies can also benefit from a discounted rate of just €250/1.2M Tomen (for local Iranian operating companies).

**We look forward to welcoming you to Tehran in November.**

## At a glance programme

### Saturday 25 November

08:00	<p><b>Registration opens</b> Registration sponsored by </p> <p>Auditorium sponsored by </p>	
09:00 – 10:30	<b>Opening keynote plenary session: Market outlooks</b>	
10:30 – 11:00	<p><b>Refreshment break</b> Sponsored by </p>	
11:00 – 13:00	<p><b>Technical papers:</b> Improving the efficiency and emissions management of your plant</p>	<p><b>Workshop 1:</b> Latest catalytic innovation and solutions for syngas Hosted by </p>
13:00 – 14:30	<b>Networking lunch</b>	
14:30 – 15:30	<p><b>Technical papers:</b> Exploring opportunities for product diversification</p>	<p><b>Workshop 2:</b> Extracting more value from existing syngas plant assets Hosted by </p>
15:30 – 16:00	<p><b>Refreshment break</b> Sponsored by </p>	
16:00 – 17:00	<p><b>Technical papers:</b> Effective reformer management</p>	<p><b>Workshop 2:</b> Extracting more value from existing syngas plant assets (continued) Hosted by </p>
17:00	<b>Close of day one</b>	

### Sunday 26 November

08:00	<p><b>Registration opens</b> Registration sponsored by </p> <p>Auditorium sponsored by </p>	
09:00 – 11:00	<p><b>Technical papers:</b> Ammonia catalysts, operations and revamps</p>	<p><b>Workshop 3:</b> Corrosion aspects in urea plants and the developments and benefits of Safurex® steel Hosted by </p>
11:00 – 11:30	<p><b>Refreshment break</b> Sponsored by </p>	
11:30 – 12:30	<b>Technical papers (Plenary):</b> Maximising production and performance	
12:30 – 14:00	<b>Networking lunch</b>	
14:00 – 15:30	<b>Technical papers (Plenary):</b> Maximising the value of your assets	
15:30 – 16:00	<p><b>Refreshment break</b> Sponsored by </p>	
16:00 – 17:00	<b>Technical papers (Plenary):</b> Ammonia and urea operational case studies	
17:30	<b>Close of conference</b>	

## Programme

### Saturday 25 November

08:00 **Registration opens**

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### Keynote plenary session

Auditorium sponsored by

**KBR**  
TECHNOLOGY

08:50 **Recitation of verses from the Holy Quran  
National Anthem of I.R. Iran**

09:00 **Welcome address**

*Speaker to be confirmed*

09:30 **Overview of the Iranian nitrogen + syngas market**

*Speaker to be confirmed*

10:00 **Global nitrogen market outlook**

*Gavin Ju, Senior Consultant - Nitrogen, CRU*

10:30 **Refreshment break**

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10:30 **Exhibition opens**

### Dual-streamed technical programme

#### Stream A: Technical Papers: Improving the efficiency and emissions management of your plant

11:00 **Stamicarbon's latest energy improvements: Launch Melt™ flash design and Launch Melt™ ultra-low energy design**

*Massimo Gori, Stamicarbon*

When the Launch Melt™ Pool Condenser Design (formerly known as Urea 2000Plus™ process) was introduced in urea industry, it caused a stir because of how innovative it was: pool condensation, a compact and simplified design, the use of Safurex®, the most innovative material for urea application.

The Launch Melt™ Pool Condenser Design has become a standard in the urea industry. Meanwhile Stamicarbon kept working on improvements, changes and innovations. That brought a family of variations of the original process. Two of them, the Launch Melt™ Flash Design and Launch Melt™ Ultra Low Energy Design, are particularly innovative and will enhance the profitability of the industry.

Launch Melt™ Flash Design is a simplified, less CAPEX intensive Pool Condenser Design, as it gets rid of a piece of HP equipment. Yet, it manages to achieve substantial savings in OPEX as it brings a dramatic reduction in steam and cooling water consumption.

Launch Melt™ Ultra Design is Stamicarbon ultimate technological statement (so far) in terms technology and sets the new benchmark (again) for the lowest OPEX in the urea industry. Steam consumption is now below 600kg / MT urea.

Both processes have already been sold or are in operation. The paper, building on the well-known characteristics of the Launch Melt™ Pool Condenser Design will explain what led Stamicarbon's engineers to the development of the new concepts and will give a detailed insight on their characteristics and benefits.

## Programme

### 11:30 **NIIK's energy saving technologies**

*Speaker to be confirmed, NIIK*

One of the fields of NIIK's activity is the development of energy efficient technologies for urea production. The solutions on energy efficiency are presented in synthesis, distillation and evaporation units.

One of the key activities in the NIIK revamping concept is modernization of synthesis section. For this section NIIK has developed the set of internal devices installed into urea synthesis reactor: the high efficient vortex mixer at the reactor inlet (bottom part), conversion booster in a carbamate formation zone, new efficient trays in a urea formation zone. Installation of a set of internal devices enables to increase CO<sub>2</sub> conversion rate in the synthesis reactor and reduce the amount of urea recycle which results in energy saving.

NIIK has its own proprietary technologies on urea plants revamping: URECON®2006 for the plants with total liquid recycle and URECON®2007 for urea units with CO<sub>2</sub> stripping. The heat recovery principles used in the concept together with implementation of internal devices provide the highest efficiency of urea manufacture process.

All the technologies are implemented at urea synthesis unit in Russia, FSU countries as well as in India. Successful completion of guarantee test runs demonstrates their highest performance.

### 12:00 **Use of indirect plate heat exchangers to increase plant competitiveness by reducing energy consumption**

*Speaker to be confirmed, Solex Thermal*

Revamping is an increasingly preferred option to improve tight operational margins or to comply with new environmental regulations.

It is possible to individuate three main areas for revamping: improve efficiency by lowering the OPEX; increase production; and reduce emissions by lowering the amount of air. These are achievable by installing a new scrubbing system.

Solex technology can offer suitable solutions with relatively low investment, which will address the specific needs of the plant.

- Reduce energy consumption: The Solex approach involves removing the main power draws in a typical granulation process. The Solex cooler installation is a marginal capex cost which will be recovered in less than two years of operation.
- Increase production: The Solex solution for debottlenecking the cooling capability, after revamping, is to install an additional Solex cooler in series at the existing cooler. A new production line or changing the major equipment leads to overloading of coolers with difficulties of reaching the desired temperature and product quality. Solex can provide an economic and feasible option.
- Reduce emissions: New environmental laws are more and more strict on particle emissions. To achieve the desired PPM limit, you need to build an extra scrubber with substantial investment from CAPEX and OPEX point of view.

The Solex Cooler needs a limited amount of air to operate which can be easily vented into the granulation scrubber. Removing a fluid bed cooler and installing a Solex bulk flow cooler will bring down the amount of air to approximately 1/20.



## Programme

### 12:30 **Grass roots ammonia technology: Advanced Purifier™ and Synloop options**

*Speaker to be confirmed, KBR*

Fertilizer producers have been under increasing pressure to remain competitive by securing favourably priced feedstocks and reducing cost of production. As a result, fully integrated, large fertilizer complexes are becoming more popular. KBR has been a premier partner to the fertilizer industry for over 6years, delivering superior process technologies and expert engineering and construction services.

KBR's Purifier™ process solution delivers the most optimized ammonia production facility with reduced capital costs, highest energy efficiency, flexibility of operation and reliability. Since the first Purifier plant started up in 1966, KBR has licensed, designed, engineered and/or constructed 28 Purifier ammonia plants worldwide, achieving significant operating records and low energy costs.

Implementing Purifier technology enables the use of air instead of oxygen in the reforming section of the ammonia plant, eliminating need for an expensive air separation unit.

PURIFIER™ technology reduces capital costs through:

- Low Energy Consumption of 6.5 Gcal/MT (ISBL, LHV basis)
- About 30% lower number of reformer tubes in Radiant section of Primary Reformer
- 10% to 15% Smaller size of all Equipment on Synthesis
- No Purge gas recovery unit required
- Flexibility and greater stability of operation
- Improved environmental compliance with reduced CO<sub>2</sub> and NO<sub>x</sub> emissions
- Typically, plants run 3-4 years without a maintenance shutdown

With an ever growing global petrochemicals and refining market, the production of carbon dioxide and hydrogen as by-products of these industries leads to opportunities for Ammonia production at reduced energy consumption and improvement in environmental control. A case study for such an example will be considered and presented as an opportunity for a Synthesis Loop configuration in a grass roots application.

## Stream B: Workshops

### 11:00 –13:00 **Latest catalytic innovation and solutions for syngas: Ammonia, methanol, hydrogen and DRI catalytic technology**

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The production of Ammonia, Hydrogen, Methanol as well as at Direct Reduced of Iron (DRI) involves the use of several key unit catalytic operations. Operations and technical crews should routinely review and analyse process monitoring systems and procedures to ensure that the consequences of mal-operation are understood and best available procedures and technology are in place. Selection of the appropriate catalyst technology for each unit operation is also very crucial for profitable and sustainable operation.

This workshop is organized to facilitate a better understanding of the recently developed and commercialized catalysts and process technologies. We will also discuss how to conduct a good performance evaluation/projection of Ammonia/Hydrogen/ Methanol and DRI plants which will help to maximise the efficiency and productivity of the plant.

### 13:00 **Networking lunch**



## Programme

### Stream A: Technical papers: Exploring opportunities for product diversification

#### 14:30 **Diversification opportunities: integrated production from Methanol to Urea and Melamine**

*Speaker to be confirmed, Casale*

From a process standpoint, linking of ammonia and methanol production is rational because conventional methanol plants based on natural gas feedstock produce excess hydrogen, available at high pressure in the loop purge. This excess hydrogen could be used more efficiently and profitably to produce ammonia rather than burnt as fuel. PSA technology finds a perfect application for H<sub>2</sub> purification from purge gas, which is mixed with N<sub>2</sub> from an Air Separation Unit to feed an inert free synthesis loop.

In case urea production is needed, CO<sub>2</sub> can be profitably recovered from reformer flue gas and compressed at required synthesis pressure. For further products diversification, CASALE has also developed an optimized integrated process which produces melamine from ammonia and carbon dioxide taking advantage of the superior process features of the HP Low Energy Melamine (LEMTM) process and the advanced concept of Urea Split Flow and Full Condenser Process.

Ratio between methanol, ammonia, urea and melamine has a certain flexibility to cope with the client's and market's needs.

Casale is the only company that has in its portfolio all the significant technologies necessary for the realization of a project from methanol to melamine. This peculiarity can ensure the best integration of the process units resulting in the maximum efficiency with the minimum capital investment.

#### 15:00 **Euromel® melamine process by Eurotecnica**

*Speaker to be confirmed, Eurotecnica Engineers & Contractors SpA*

Eurotecnica Group is known for its leading position as technology provider, designer and implementer of Melamine production plants. Proprietary Euromel® Melamine Process is recognized as technology of reference for the sound performances in terms of product quality, total zero pollution and reliability.

Methanol Holding Trinidad; Qatar QAFCO; ZAP Grupa Azoty; KHPC; Petrobras; China Zhong Yuan Dahua, Petrochina, Xinjiang XLX and Yihua, are just some world players that have chosen Euromel® Melamine Process.

The main advantages of the Euromel® Melamine Process are:

- Easy integration of urea-melamine units: Thanks to the pressure and composition of the off-gases which can be adapted to any urea plant.
- Lowest CAPEX and OPEX: Environmental compliance, low energy consumption and absence of add-on chemicals for purification (that typically generate safety concerns) contribute for the lowest opex throughout an exceptionally long period.
- Total Zero Pollution: The Euromel® Melamine Process performs the melamine purification using ammonia only, a feedstock naturally available in, and fully recyclable to, any Fertilizer Complex. Not being dependent on costly add-on chemicals or catalysts gives the advantage of avoiding the generation of liquid or solid pollutants released at battery limits. Expensive treatment systems, related add-on chemicals and additives for neutralization, inertization and disposal are not needed either in the Euromel® Melamine Process.
- Branding and Networking: The awareness of being the focal point of a global melamine network sharing common values such as product purity, consistency and reliability has suggested ETCE Group to create a trademark that formally identifies the distinctive marks of a quality product.
- Safety and reliability: Euromel® Melamine Process features the highest safety standards and stream factors.

Recently Eurotecnica has licensed, designed and implemented the largest single reactor HP melamine plant, with a nameplate capacity of 60kty. The plant has been started-up in September 2016. Eurotecnica is already engaged with the client for the construction of a twin unit. Both plants embody the ultimate achievements of the 4th generation Euromel® Melamine Process.

To date Eurotecnica has licensed and implemented as many as 21 Melamine units worldwide for a total output accounting up to 670,000ton/year.

This paper will outline the Euromel® Melamine Process and draw on several references.

#### 15:30 **Refreshment break**

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## Programme

### Stream A: Technical papers: Effective reformer management

#### 16:00 **Operating at peak performance with Topsoe reformer management**

*Speaker to be confirmed, Haldor Topsor*

A key factor in increasing profitability and capitalizing on growth opportunities is the ability to achieve the full potential of plant performance, especially from the steam reformer. Correcting inefficiencies in the steam reformer should be prioritized because even very small changes can have a large impact on overall performance. In order to better help producers upgrade their steam reformer performance and reliability, Topsoe has combined innovative thinking with decades of experience to improve upon the already extensive repertoire of services and tools used for assessment and optimization.

A primary focus of the improvements is on tube wall temperatures (TWT) due to the lack of precision when using conventional methods for measuring TWT. Results from extensive infrared pyrometer studies reveal why and when to use different pyrometer types, and this knowledge will help producers optimize their steam reformers by maintaining operation closer to design temperatures.

Topsoe is also introducing a concept for advanced reformer surveillance, which provides additional temperature data via continuous monitoring. Other Topsoe developments aside from temperature management include better guidelines for tube life assessments and an improved hot restart procedure that increases ease of operation and decreases the risk of tube rupture. With these advances in steam reformer services, Topsoe can better help customers adhere to design limits, identify bottlenecks, save energy, increase tube lifetime, and optimize operations.

#### 16:30 **Latest developments and material selection for catalyst tubes in steam methane reformers**

*Hugues Chasselin, Manoir Industries*

Catalyst tubes in steam methane reformers are amongst the most critical components: exposed to extreme conditions, and made of high grade alloys, they nevertheless tend to be considered more and more as commodities. However, the know-how of experienced catalyst tubes manufacturers can make a significant difference in costs during operation. This paper will focus on how critical the alloys are, not for their designation, but for their recognized and achieved creep properties. The importance of the creep test raw data in ensuring a reliable Larsen & Miller curve should be the key for a decision to purchase the right alloys with appropriate thickness. Few alternative alloys now offer possibilities to minimize the catalyst tube thickness to enhance the heat transfer and make fuel savings, without jeopardizing their integrity. Degradation mechanism and how to limit the same will also be discussed.

### Stream B: Workshops

#### 14:30 – 17:00 **Extracting more value from existing syngas plant assets**

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A workshop aimed at sharing best practice and experience, to help educate and to demonstrate Johnson Matthey's capabilities. This will be a technical input with a series of presentations and Q&A sharing latest catalyst and technology developments and services, with a particular focus on getting the most from your syngas plant through improved energy efficiency, enhanced plant economics, maximizing throughput and reliability.

#### 17:00 **Close of day one**

## Programme

## Sunday 26 November

08:00 **Registration & exhibition opens**

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**TUBACEX**  
GROUP**Dual-streamed technical programme**

Auditorium sponsored by

**KBR**  
TECHNOLOGY**Stream A: Technical papers: Ammonia catalysts, operations and revamps**09:00 **Carbon formation and gas pipeline black powder; Factors accelerate HDS reactor catalyst (CO-MO) deactivation in ammonia plants***Alireza Orooji, Pardis Petrochemical Co.*

Carbon formation is one of the major causes of Hydro Desulfurization catalyst deactivation in ammonia plants. However due to the presence of a large excess of hydrogen, carbon formation in these reactors is slow theoretically, but it depends on the type of feedstock and the operating conditions in practice. Once the catalyst becomes deactivated or develops excessive pressure drop, it may be replaced, or catalyst bed top layer skimming to restore it to approximately its original condition. The frequency of catalyst bed replacement or skimming will depend on the type of feedstock and the operating conditions. The catalyst replacement period may be between few months to several years depending on these conditions. Information on the degree of deactivation is very important for predicting catalyst life, from which the catalyst design could be further improved. The other cause of efficiency loss and deactivation of HDS (CO<sub>2</sub>MO, Ni<sub>2</sub>MO) catalyst is decontaminations carry over in which the main part is gas pipeline Black Powder. Black Powder in the feedstock natural gas pipeline is the other source in which increase the pressure drop of the catalyst bed and affect the performance of the reactor. Black Powder (composite of iron oxides, iron sulfides) is a typical contaminant in transmission pipelines which is a composite of iron oxides, iron sulfides, varying dirt such as silica and calcium as well as chloride, sodium and other material particulate. It is known for being detrimental to pipeline equipment and for causing operation and maintenance issues. Understanding its physical characteristics and its nature is necessary for ammonia and methanol operators to consider the appropriate separation technology. Installation of a high performance properly designed filters is an efficient and cost effective solutions to enhance the reliability of HDS reactors operation in ammonia plants. This paper explained continual catalyst carbon formation and black powder contamination in HDS reactors in several ammonia plants which led to increase in differential pressure and the deactivation of the CO<sub>2</sub>MO catalyst and become a bottleneck of the plant. The main causes of this problem are studied and the methods of prevention are discussed.

09:30 **Extreme control system of multiple section reactor with model***Speaker to be confirmed, Alvigo*

This paper presents control system with ammonia converter model, which will allow the ammonia synthesis process to be carried out in the optimal mode. The proposed control system will give the opportunity to maximize the conversion degree of synthesis gas to ammonia in one pass through the column at various loads to the unit taking into account changes in the properties of the catalyst and other process parameters. The system does not require additional investments and provides an opportunity to work with the measuring channels, which have been already implemented at the operating plant.

The modern chemical plants are characterized by high technological effectiveness and complex equipment implementation. The most part of chemical plants, existing in Ukraine, have been built in 70th – 80th of last century according to schemes, which, as for today's date, are characterized by high power consumption for unit of output. In ammonia production, for example, energy consumption per 1t of ammonia is about 10-11 Gcal. That is why the activities, focused on technical process optimization, and as a consequence, reduction of power consumption per 1t of products, are extremely important nowadays.

The objective of this work is control system development with converter model in ammonia production, which will allow conducting ammonia synthesis process in optimal mode.



## Programme

### 10:00 **Cutting edge solutions for ammonia plant revamps**

*Speaker to be confirmed, Haldor Topsoe*

In today's competitive market conditions, producers need solutions that keep production cost low enough to meet profit target. In the ammonia industry, even minor process improvements can have a considerable impact on the bottom line.

Topsoe solutions for plant revamps and optimization services maximize the potential impact by increasing plant utilization and minimizing energy consumption, all the while ensuring safety and reliability. Major revamp options from Topsoe include optimization of the ammonia loop by addition of the single-bed radial flow S-50 converter to boost production capacity and implementation of heat exchange reforming such as Haldor Topsoe Exchange Reformer (HTER) to increase reforming and production capacity. Along with improvements in energy efficiency and production capacities, revamp options can help producers operate with more flexibility.

One such flexibility made possible by a new Topsoe development is the ability to reduce the plant steam-to-carbon ratio to levels limited only by process requirements and not by the high temperature shift (HTS) catalyst. This new development is the SK-501 Flex™ HTS catalyst, which differs from all other HTS catalysts in its iron- and chromium-free composition. Without the iron content, there are no risks associated with over-reduction at low steam-to-carbon ratios. When combined with state-of-the-art revamp technologies, the catalyst is a major asset that opens up new potentials for optimizing plant performance and improving profitability.

In addition, the complete absence of chromium in SK-501 Flex™ gives producers a further advantage of reducing health, safety, and environmental risks. As the first of its kind, the catalyst is a vanguard in the future of water gas shift catalysis, meeting growing pressure from legislative bodies and safety standards while continuing to push the boundaries of operational excellence.

### 10:30 **Outstanding performance of novel ammonia synthesis catalyst: Case studies of 15 years' experience**

*Dr. Jovica Zorjanovic, Clariant*

Since the design of ammonia plants have become more demanding, high performance and reliable catalysts are increasingly important. A higher catalytic activity at lower pressure plays a major role for smaller and less costly reactor designs and a more efficient ammonia production. And catalyst efficiency is key factor in keeping production costs down for all production units. This growing importance led to the development of novel ammonia synthesis catalyst.

Conventional ammonia synthesis catalysts are made by fusing natural magnetite (Fe<sub>3</sub>O<sub>4</sub>) with potassium carbonate, alumina and other components, such as CaO, SiO<sub>2</sub> and other metal oxides. In contrast to the conventional catalysts the novel ammonia synthesis catalyst AmoMax® 10 is based on ferrous oxide, Wustite. Wustite is a non-stoichiometric iron oxide (Fe<sub>1-X</sub>O) with a cubic crystal structure where X is ranging from 0.03 - 0.15, providing a significantly lower oxygen content than magnetite, the precursor of the traditional catalyst.

As result of, AmoMax® 10 is not only more active than traditional magnetite catalysts, but it also provides a much higher activity at lower temperature. AmoMax® 10 also has a substantially better performance than the magnetite reference at lower pressure. In additional, AmoMax® 10 not only provides higher initial activity, but it also undergoes less deactivation with time on stream. Comparatively, it behaves much better than the magnetite based catalyst. This has been confirmed by stable commercial operation at several references that have been on-stream for 15 years.

## Stream B: Workshops

09:00– 11:00

### **Workshop: Corrosion aspects in urea plants and the developments and benefits of Safurex® steel**

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In the high pressure synthesis section of a urea plant, the highly corrosive process environment is one of the challenges with respect to safe and reliable operations. Stamicarbon has gained more than 40 years of experience and know-how in combatting these corrosion risks. This is realized by developing excellent corrosion resistant stainless steels, optimized design of the critical equipment, optimal fabrication technologies and guidelines for safe operations (operating windows).

In this workshop an overview will presented on the typical corrosion issues encountered in urea plants and the counter-measures to minimize these risks. Case histories of catastrophic failures and near misses will be discussed as well as the lessons learned. Furthermore the latest developments on materials will be presented, such as the introduction of two specialty Safurex® grades: Safurex® STAR and Safurex® DEGREE.

## Programme

11:00 **Refreshment break**

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### Plenary technical papers: Maximising production and performance

11:30 **Maximising value through the plant lifecycle**

*Matthew Humphrys, Johnson Matthey*

Choosing the best technology and catalysts is not enough to maximize the value of your syngas plant throughout its life cycle. Johnson Matthey (JM) concentrates on five key 'pillars' to help its customers improve overall performance and profitability. Those pillars are efficiency, throughput (capacity), integrity and reliability, environment and safety. This paper aims to describe ways in which the operator can draw on the experience of JM and its strategic partners to improve plant performance in these areas.

12:00 **KBR Technology options for improved production costs, reliability & efficiency**

*Speaker to be confirmed, KBR*

For over 60 years, KBR has been a pioneer in providing innovative technologies in the field of Ammonia Production. These technologies have helped Ammonia producers revamp their plants in a cost effective manner while reducing operating costs. This paper will discuss the variety of options open to existing ammonia producers that have used various KBR technologies to revamp their plants. The paper will discuss other cost effective revamps from KBR's basket of available technologies.

Ammonia plant revamps are typically executed to perform the following:

- Capacity expansion to reduce cost per ton
- Energy efficiency (reduction in OPEX)
- Environmental and regulatory compliance
- Feedstock substitution
- Equipment repair/maintenance or retrofit
- Increase reliability and operating flexibility
- Ammonia plant automation upgrades

The paper will include case studies for an ammonia plant capacity expansion project using KBR's Reforming Exchanger System (KRES™) technology for increasing capacity of the reforming section. The KRES unit was licensed and engineered by KBR to increase the ammonia plant capacity. This paper considers actual operation of a revamped unit containing a KRES and explores the unique combination of the new synthesis loop revamp technology in the back-end with KRES technology in the front-end of the ammonia plant. The two technologies have a synergistic effect with KRES providing increased capacity with reduced steam generation, and the new synthesis loop technology providing additional steam generation capability. The combination of these two technologies can result in an attractive revamp scheme with significant capacity increase and energy savings as illustrated by the case studies in this paper. Operability of this combination is analysed in view of up to date experience of the KRES operations.

Completing a licensed technology based revamp project requires specific technology focused, proven project execution methodology to realise an efficient and a reliable plant. This paper will discuss how different agencies collaborated on the design, project execution, installation and commissioning of the KRES unit at the site. Engineers from KBR, client, catalyst supplier were on-site to make sure this new technology was safely and successfully implemented and commissioned.

12:30 **Networking lunch**

## Programme

### Plenary technical papers: Maximising the value of your assets

#### 14:00 **Technology options for gas monetization**

*Peter Roberts, Johnson Matthey*

Globally with the more recent development of shale gas complementing the existing conventional gas resources, gas offers a cleaner lower carbon route to many chemical intermediates and products than the historical use of oil. Increased use of gas to make oil derivatives also offers a route to mitigate oil imports for some countries. Iran is well placed having abundant supplies of natural gas and so has the opportunity to create great value when monetizing these resources. In doing so it can maximize this wealth creation by use of leading edge technologies that both minimize carbon footprint but also make best use of other limited natural resources e.g. water. The paper describes Johnson Matthey's range of technologies that might contribute to this wealth creation in an environmentally friendly way.

#### 14:30 **Ammonia, urea and melamine production: Advantages of integrated design**

*Speaker to be confirmed, Casale*

The Iranian nitrogen industry has already appreciated the value of Casale ammonia technologies for grass-root plants thanks to the successful applications in Razi and Shiraz sites. Also, the referenced combination of urea Split Flow and Full Condenser technology with Low Energy Melamine process is demonstrated to be an optimized solution, offering to the Customers an interesting option to diversify their production portfolio realizing multi-product fertilizer complexes. With its deep knowledge of ammonia, urea and melamine technologies, Casale can optimally design the three units as a single plant, whose battery limits are the inlet natural gas and the outlet solid products. This paper provides an overview of the advantages of this approach.

#### 15:00 **Compelling opportunities in fertilizer plants: smart environment protection systems and a new approach to product logistics**

*Speaker to be confirmed, Prozap*

Environmental care and effective product logistics are becoming decisive factors to guarantee good business relationships with the end user. Notwithstanding the fact that installation of an environment protection system in a fertilizer plant is generally perceived as an expense forced by authorities, use of latest technology, such cost can be offset by revenues from selling of scrubbing process by-product. Moreover, effective bulk storage, packaging and expediting facilities - on site but also in the network of remote distribution hubs - greatly contribute to client's loyalty.

#### 15:30 **Refreshment break**

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## Programme

### Plenary technical papers: Ammonia and Urea operational case studies

#### 16:00 **Toyo's start-up experiences of large-scale urea granulation plants -3,500 and 4,00 MTPD**

*Speaker to be confirmed, Toyo Engineering Corp.*

Toyo Engineering Corporation (TOYO), global leading engineering contractor and urea process licensor, has accomplished new 2,700 metric tons per day (MTPD) ammonia and 3,500 MTPD urea project for PT. Pupuk Kaimantan Timur in Indonesia in October 2015. Additionally, the world largest single train 4,000 MTPD urea granulation project with 2,300 MTPD ammonia plant for Indorama Eleme Fertilizer & Chemicals Limited in Nigeria has been started commissioning and scheduled to commence commercial operation in summer of 2016. TOYO's own process ACES21® and Spout-Fluid Bed Urea Granulation technology have been applied for both projects. Completion of Kaltim-5 and IEFCL denotes success of more than 30% of scale up from former project and proves TOYO's capability as an EPC contractor for large scale Fertilizer Project. Moreover, TOYO has completed technical evaluation of 6,000 MTPD jumbo single train urea plant from the various aspects of process design, equipment fabrication, transportation, and construction. As a result, we came to conclusion that this kind of jumbo scale plant is realizable with the same approach as Kaltim-5 and IEFCL. This paper describes TOYO's latest EPC and commissioning experiences of large scale ammonia-urea projects and bright prospect for implementation of jumbo single train urea plant with the approach assured by the accomplishment of these projects.

#### 16:30 **Setting new standards in ammonia synthesis converters catalyst unloading and internal maintenance; methodology issues and safety challenges**

*Alireza Orooji, Pardis Petrochemical Co.*

*Speaker to be confirmed, Contract Resources*

The ammonia synthesis converters are key equipment in ammonia plants and their reliability are essential in the production. Non-observance of start-up and shut down procedures of ammonia synthesis converters consist of rapid pressurizing and de-pressurizing also temperature shock to the internal equipment of these converters had caused damage to the internal basket, intercoolers, piping and the catalyst. The vertical and horizontal ammonia synthesis converters are subject to have a quite complicated mechanical design with multiple catalyst beds which convert the internal maintenance and catalyst replacements of these converters as a special operation. From a safety point of view, internal maintenance and catalyst replacement of these reactors are critical. It is important that the reduced ammonia catalyst had not come into contact with air since they are highly pyrophoric. Therefore, these operations should be done under nitrogen atmosphere with high consideration of safety standards. The catalyst lifetime ending, internal leaks due to mechanical failures or revamp of internal baskets are the main reasons for catalyst unloading. The method of catalyst unloading operation for each reactor type due to different internal design is unique. This paper will explain case studies about internal mechanical and catalyst damages of some vertical and horizontal ammonia synthesis converters during operation and the process cause and consequences of these failures are discussed. Methodology issues and safety challenges which might be occurred during internal inspection, catalyst unloading and mechanical works under inert atmosphere of these reactors will be presenting details.

#### 17:00 **Close of conference**

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Family name \_\_\_\_\_ Job title \_\_\_\_\_

Unique email \_\_\_\_\_

Tel \_\_\_\_\_ Fax \_\_\_\_\_

Dietary requirements \_\_\_\_\_

Delegate 2 Title: Mr/Mrs/Ms First name \_\_\_\_\_

Family name \_\_\_\_\_ Job title \_\_\_\_\_

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