COURSE OVERVIEW PE0060-4D
Fertilizer Manufacturing Process Technology

Course Title
Fertilizer Manufacturing Process Technology

Course Date/Venue
September 02-05, 2024/Al Aziziya Hall, The Proud Hotel Al Khobar, Al Khobar, KSA

Course Reference
PE0060-4D

Course Duration/Credits
Four days/2.4 CEUs/24 PDHs

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

The fertilizer industry is essentially concerned with the provision of three major plant nutrients - Nitrogen, Phosphorus and Potassium (NPK) - in plant-available forms. All major nitrogen (N) fertilizer sources begin with the fixation of non-plant available atmospheric N_2 molecules into anhydrous ammonia molecules (NH_3). The process of converting N_2 to NH_3 is referred to as the Haber-Bosch process.

Ammonia synthesis requires large amounts of energy. Nowadays, ninety-eight percent of the ammonia produced in the world is by catalytic steam reforming of natural gas. The gas is converted to hydrogen, purified, and reacted with nitrogen to produce ammonia. The development of ever larger, gas-based ammonia plants, affording large amounts of by-product carbon dioxide allowed for utilizing this carbon dioxide in the manufacture of urea. Urea is the product of the reaction of ammonia with carbon dioxide. It contains 46% N. Consequently, it offered a further significant advance in plant nutrient concentration, and hence in savings in nutrient transportation and distribution.

Today, urea is one of the most common nitrogen fertilizer. Urea manufacture is associated with anhydrous ammonia production in modern plants because carbon dioxide is a by-product of ammonia production and is thus readily available to react with the ammonia. The urea can either be dried and granulated into 46% N urea fertilizer, or dissolved in water with ammonium nitrate to make urea ammonium nitrate (UAN) solution.

In most of the modern fertilizer manufacturing plants, most of the ammonia is used on site in the production of urea. The remainder is sold domestically for use in industrial refrigeration systems and other applications that require anhydrous ammonia. The urea is used as a nitrogen-rich fertilizer, and as such is of great importance in agriculture and is also used as a component in the manufacture of resins for timber processing and in yeast manufacture.

This course is designed to provide an in-depth view of nitrogen fertilizer production technologies in general and the **production of ammonia and urea using natural gas** in particular. The course will guide participants to identify future trends and needs of this fast pace industry. The course will examine the status and the most recent fertilizer production technologies to produce fertilizers and intermediate materials. Looking further ahead, the course will review some potentially significant developments and concepts that may impact the manner in which ammonia and urea are produced. Some of these manufacturing routes are being tested or employed at few plants around the world, but have yet to be fully developed into commercial processes.

The course will also provide an opportunity to exchange ideas and disseminate information through discussion of the various technical, economic, safety, and environmental issues. The knowledge gained will enable the participants to solve specific problems at his/her plant as well as improve its operation and enhance its profitability. Further, the course will review new technologies such as isobaric manufacturing, the use of gas heat reformers, hydrogen separation, carbon dioxide removal technology, product ammonia separation, and high activity synthesis catalyst which can result in a significant reduction in energy consumption when compared with traditional technology.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply comprehensive knowledge and skills in the manufacturing process of fertilizers
- Discuss the ammonia production processes such as reforming, oxidation, removal of carbon monoxide & water and synthesis of ammonia
- Identify and list nitrogen fertilizer production such as nitric acid, ammonium nitrate, urea and ammonium sulfate
- Recognize and improve ammonia production processes and identify & describe the various processes involved in ammonia production
- Improve urea production processes and identify & describe the various processes involved in urea production

- Identify fertilizer chemical and physical specifications and determine its product quality
- Recognize speciality fertilizer additives including compound and specialty fertilizers manufacturing process technology
- Apply proper methodology of packaging, transportation and handling of fertilizer products and recognize its importance in the manufacturing industry
- Review energy, environmental and safety issues of fertilizer manufacturing and suggest ways and means on how to resolve such issues

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of fertilizer manufacturing process technology for those who are working in the fertilizer industry, particularly those who have recently assumed new responsibilities, to increase their technical knowledge in fertilizer production and for experienced staff to become better acquainted with new technologies in the industry. The course will help to improve the participants' skills and broaden their vision and understanding of the entire industry, including technology, economics, energy, use, safety and environmental stewardship.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Fee

US$ 4,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- The International Accreditors for Continuing Education and Training (IACET-USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **2.4 CEUs** (Continuing Education Units) or **24 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Robert Harvey, MSc (Cum Laude), BSc is a **Senior Chemical Engineer** with over **45 years** of in-depth industrial experience within the **Oil & Gas**, **Refinery**, **Petrochemical**, **Mining** and **Power** industries. His expertise widely covers in the areas of **Fertilizer Manufacturing** Process Technology, **Fertilizer Storage** Management (Ammonia & Urea), **Petrochemical & Fertilizer** Plants, **Nitrogen Fertilizer** Production, **Petroleum Industry Process** Engineering, **Process Equipment** Design & Troubleshooting, **Process Equipment & Piping Systems**, **Fertilizer** Manufacturing Process Technology, **Production** Management, **Process Plant** Optimization & Continuous Improvement, **Revamping & Debottlenecking**, **Pressure Vessel** Operation, **Heat Mass Balance**, **Distillation-Column** Operation, & Troubleshooting, **Production Process** Optimization, **Debottlenecking**, **Unit Performance** Optimization, **Process Analyzers**, Real Time Online Optimization, **Operations Planning** Optimization, **Engineering Problem Solving**, **Bag Filters** Operation & Maintenance, **Process Equipment** Design, Chemical Reaction Engineering Application, **Phosphatic Industry**, **Diammonium Phosphate**, **Monoammonium Phosphate**, **NPK**, Troubleshooting Improvement, **Production** Management, **Distillation-Column** Operation & Troubleshooting, Vinyl Chloride Monomer (**VCM**) Manufacturing & Process Troubleshooting, **Monomer** Handling Safety, **Cement** Manufacturing Process Technology & Standards, Complex Operational Troubleshooting, Incident **Root Cause Analysis** & Corrective Action, **Process Equipment & Piping** System, **Fertilizer** Manufacturing, **Process Plant** Optimization & Continuous Improvement, **Process Plant** Performance & Efficiency, Continuous Improvement & Benchmarking, **Energy Efficiency** for Process Plants, **Pressure Vessel** Operation, **Reactors & Storage Tanks**, Dehydrating Columns, Heat & Material Balance, **Troubleshooting Process Operations**, Modern **Aluminium Production Processes**, **Cement Kiln Process**, **Process Engineer Calculations**, Steel Making Process, **P&ID** Reading & Interpretation, **Detailed Engineering Design**, **Process Diagrams** Review, Process Hazard Analysis (**PHA**), **HAZOP** Leadership, Project HSE Review (**PHSER**), Safe Handling of **Propylene Oxide & Ethylene Oxide**, Safety in **Process & Industrial Plants**, Environmental Impact Assessment (**EIA**) and Effective **Risk Assessment & HAZOP** Studies. Further, he is also well versed in Feasibility Studies Analysis & Evaluation, Project Gate System Procedures, Process Mapping, Change Management Skills, Change Management Strategy, Strategical Process Control in Process Industry, Developing Commercial Contracts, Project Management Skills, Project Scheduling & Cost Control, FIDIC & Other Model Contracts, EPC & EPCM Contracts, Knowledge Management, Job Evaluation, Creative Problems Solving & Innovation Skills, Problem Solving & Decision Making, Strategic Planning & Creative Thinking and Mind Mapping.

During his career life, Mr. Harvey has gained his practical and field experience through his various significant positions and dedication as the **Commercial Director**, **Manufacturing Director**, **Chief Operating Officer**, **Head Projects Division**, **Project Leader**, **Lead Technical Advisor/Consultant** and **Project Consultant** to various international companies such as the Trade and Industrial Policy Strategies (TIPS), PGBI Johannesburg, IDC Green Industries SBU/Arengo 316 Pty Ltd, Ferrum Crescent Limited, CEF Limited, Rio Tinto Alcan, Industrial Development Corporation of SA (IDC) and AECI Limited.

Mr. Harvey has **Master** (**Cum Laude**) and **Bachelor** degrees in **Chemical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and has delivered various trainings, seminars, conferences, workshops and courses globally.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Monday, 02nd of September 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***A Global Overview & Outlook of the Nitrogen Fertilizer Industry*** *Fertilizer Terminology • Fertilizer Materials & Product Types • Characteristics of Efficient Distribution Systems • Physical Properties of Fertilizer*
0930 – 0945	*Break*
0945 – 1100	***A Global Overview & Outlook of the Speciality Fertilizer Industry*** *Chemical Characteristics of Speciality Fertilizers & Specific Benefits • Compound & Specialty Fertilizers Manufacturing Process Technology*
1100 – 1230	***Economics of the Industry***
1230 – 1245	*Break*
1245 – 1420	***Economics of the Industry (cont'd)***
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2: ***Tuesday, 03rd of September 2024***

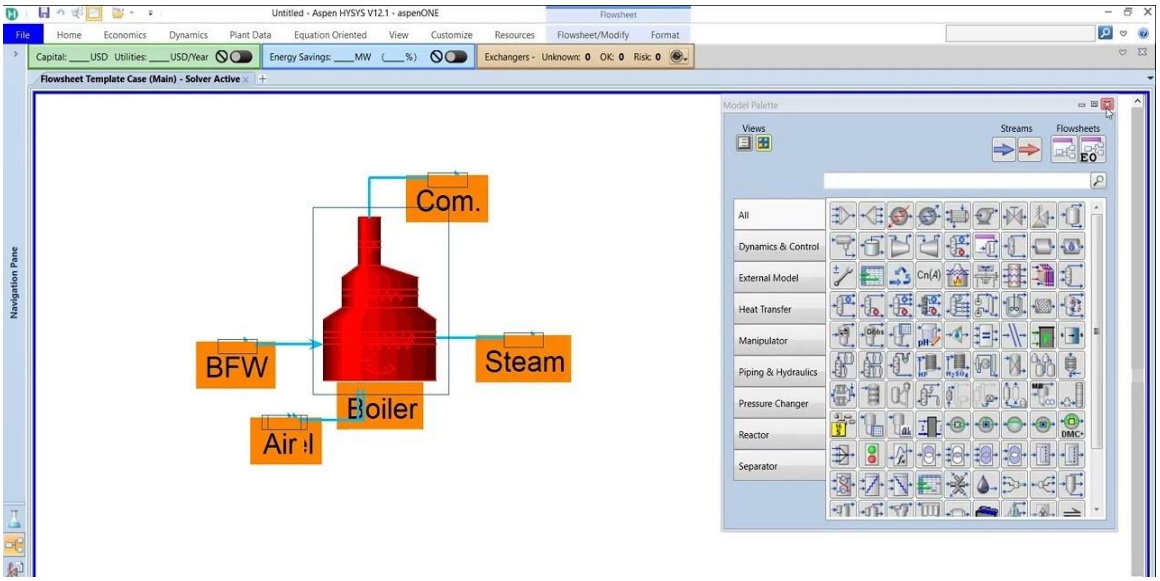
0730 – 0930	***Ammonia Production*** *Steam Reforming of Natural Gas • Excess Air Secondary Reforming • Heat Exchange Autothermal Reforming • Partial Oxidation of Hydrocarbons*
0930 – 0945	*Break*
0945 – 1100	***Ammonia Production (cont'd)*** *Hydrogen Production • Nitrogen Addition • Removal of Carbon Monoxide • Water Removal • Removal of Carbon Oxides • Synthesis of Ammonia*
1100 – 1230	***Nitrogen Fertilizer Production*** *Nitric Acid • Ammonium Nitrate • Calcium Ammonium Nitrate*
1230 – 1245	*Break*
1245 – 1420	***Nitrogen Fertilizer Production (cont'd)*** *Ammonium Nitrate-Sulfate • Urea • Ammonium Sulfate*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3:	***Wednesday, 04th of September 2024***
0730 – 0930	***Urea Production*** *Once-Through Process • Partial Recycle Process • Total Recycle Process •*
0930 – 0945	*Break*
0945 – 1100	***Urea Production (cont'd)*** *Carbon Dioxide Stripping • Ammonia Stripping • Advanced Cost & Energy Saving (ACES) Process • Isobaric Double Recycle (IDR) Process •*
1100 – 1230	***Urea Production (cont'd)*** *Urea Synthesis • Urea Purification •*
1230 – 1245	*Break*
1245 – 1420	***Urea Production (cont'd)*** *Urea Concentration • Urea Granulation - Enriched Urea*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4:	***Thursday, 05th of September 2024***
0730 – 0930	***Fertilizer Chemical & Physical Specifications & Product Quality***
0930 – 0945	*Break*
0945 – 1100	***Packaging, Transportation, & Handling***
1100 – 1230	***Energy, Environmental, & Safety Issues*** *Pollution of Air, Water & Soil • The Disposal of Waste • Decommissioning Old Plants*
1230 – 1245	*Break*
1245 – 1345	***Energy, Environmental, & Safety Issues (cont'd)*** *Global Warming & Ozone Depleting Substances • Health & Safety*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

Practical session will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the simulator “ASPEN HYSYS”.



ASPEN HYSYS V12.1 Simulator

Course Coordinator

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