COURSE OVERVIEW PE0892
Fluidized Reaction System Operations

Course Title
Fluidized Reaction System Operations

Course Date/Venue
Session 1: April 14-18, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: October 05-09, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
PE0892

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.

Fluidized beds are ubiquitous in a variety of chemical and physical processing applications as well as in natural phenomena. Despite many decades of intense research efforts of fundamentals and applications, fluidized beds still disclose unrevealed features and pose challenging issues to the research, the process engineer and the natural scientist.

The fluidized-bed reactor is the centrepiece of industrial fluidization processes. This course focuses on the design and operation of fluidized beds in many different industrial processes, emphasizing the rationale for choosing fluidized beds for each particular process. It presents both the fluid dynamics of gas-solid fluidized beds and the extensive experimental studies of operating systems and they set them in the context of operating processes that use fluid bed reactors.

This course is designed to provide participants with a detailed and an up-to-date overview of fluidized bed reactor startup, operation and troubleshooting. It covers the catalytic processes; the non-catalytic processes, combustion, gasification and chemical looping; the fluidized-bed-combustion; the conversion of biomass and waste fuels in fluidized-bed reactors; the conversion mechanisms in fluidized-bed reactors; and the operating parameters comprising of feeding methods, equivalence ratio, number of feed points, bed temperature, solid fuel feed size, effects of inserts content, bed depth and fluidizing velocity.

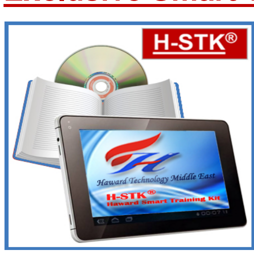
During this interactive course, participants will learn the various examples of industrial applications for fluidized-bed combustion and gasification, pyrolysis and fluid bed plasma treatment; the effects of process conditions on fluidization, the effect of temperature fluidization and the effect of pressure on fluidization; and the fluidized-bed scaling, dimensional analysis, combustion scaling and validation of the scaling laws.

Course Objectives

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

- Apply systematic techniques on fluidized bed reactor startup, operation and troubleshooting
- Describe catalytic processes covering olefin polymerization, n-butane oxidation to maleic anhydride, propylene ammoxidation to acrylonitrile, vinyl chloride monomer (VCM), vinyl acetate monomer (VAM), gas-to-liquid technologies and fluidized catalytic cracking (FCC)
- Recognize non-catalytic processes, combustion, gasification and chemical looping
- Analyse liquid-bed-combustion and conversion of biomass and waste fuels in fluidized-bed reactors
- Identify the conversion mechanisms in fluidized-bed reactors
- Carryout operating parameters comprising of feeding methods, equivalence ratio, number of feed points, bed temperature, solid fuel feed size, effects of inserts content, bed depth and fluidizing velocity
- Give various examples of industrial applications for fluidized-bed combustion and gasification, pyrolysis and fluid bed plasma treatment
- Recognize the effects of process conditions on fluidization, the effect of temperature fluidization and the effect of pressure on fluidization
- Illustrate fluidized-bed scaling, dimensional analysis, combustion scaling and validation of the scaling laws

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 fluidized bed reactor startup, operation and troubleshooting for chemical engineers, process engineers, food and pharmaceutical technologists and laboratory technical staff.

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: -

- 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.

- 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 **3.0 CEUs** (Continuing Education Units) or **30 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.

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. Abdul Ghani Anadani is a **Senior Process Engineer** with over **45 years** of industrial experience within the **Oil**, **Gas**, **Refinery** and **Petrochemical** industries. His expertise widely covers in the areas of **Process Equipment** Design, Applied **Process Engineering** Elements, **Process Plant** Optimization, **Revamping & Debottlenecking**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant** Monitoring, **Catalyst** Selection & Production Optimization, Operations Abnormalities & Plant Upset, **Process Plant** Start-up & Commissioning, **Clean Fuel** Technology & Standards, Flare, Blowdown & Pressure Relief Systems, **Oil & Gas Field Commissioning** Techniques, **Flare**, Blowdown & Pressure Relief Systems, Operation, Maintenance & Troubleshooting, **Flare** System, **Pressure Vessel** Operation, **Gas Processing**, **Chemical** Engineering. He is also well versed in **Pumps**, **Gas & Steam Turbines**, **Compressors**, **Heat Exchanger**, **Safety Relief Valves**, **Pipelines**, **Piping**, **Pressure Vessels**, **Diesel Engine & Crane** Maintenance, Maintenance Management (Preventive, Predictive, Breakdown), **Reliability** Management, **Condition-Based Monitoring**, **Rotating Equipment**, **Tanks & Tank Farms**, **Pneumatic** System, **Static** Equipment, Failure Analysis, **Auxiliary** Systems, **Ventilation** Systems, **Fuel Supply** Systems, **Emission Control**, **Preventive & Predictive** Maintenance, **Couplings & Shaft Alignment**, **Lubrication** Technology, **Blower & Fan**, **Process** Equipment, **Bearings**, **Motors**, **Gears** and Mechanical **Seals**. Further he is well-versed in **Hydrodesulfurization & Hydrogenation**, Steam **Cracking**, **Acid Gas** Removal & Treatment, **Sulfur** Production & Recovery, **Ethylene** Gas, **Furnaces**, Filtration, Distillation, Extraction, Salt Production, Caustic Soda, Ammonia, Chlorine, Benzene, **P&ID** & Process Modifications, **Distillation Column**, **Process Equipment** Design, **Process Plant** Optimization, **Revamping & Debottlenecking**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant** Start-up & Commissioning, **Oil & Gas Field Commissioning** Techniques, **Pressure Vessel** Operation, **Gas Processing**, **Process Reactors** Start-Up & Shutdown, **Gasoline Blending** for Refineries, **De-Sulfurization** Technology, **Catalyst** Technology, **Catalytic Reforming**, **Sulphur** Extraction Plant, **Crude Distillation Unit**, **Acid Plant Revamp** and **Crude Pumping**.

During his career life, Mr. Abdul Ghani has gained his practical and field experience through his various significant positions and dedication as the **Technical Manager**, **Shift Supervisor**, **Senior Project Engineer**, **Project Engineer**, **Recruited Engineer**, **Assistant Engineer**, **Technical Consultant**, **Deputy Shift Foreman** and **Shift Foreman** for numerous international companies like **QAPCO** and Banyas Refinery.

Mr. Abdul Ghani has a **Consultant** degree in **Chemical Engineering & Technology**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Auditor** as per **ISO 9000-2001**, a member of the Syrian Engineers Chamber and has delivered numerous trainings, courses, seminars and workshops internationally.

Course Fee

US$ 5,500 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.

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 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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction*** *Regimes of Fluidization ● A Brief History of Fluidization*
0930 – 0945	*Break*
0945 – 1100	***Catalytic Processes*** *Olefin Polymerization ● n-butane Oxidation to Maleic Anhydride ● Propylene Ammoxidation to Acrylonitrile ● Vinyl Chloride Monomer (VCM) ● Vinyl Acetate Monomer (VAM) ● Gas-to-Liquid Technologies ● Fluidized Catalytic Cracking (FCC)*
1100 – 1230	***Non Catalytic Processes, Combustion, Gasification & Chemical Looping*** *Titanium Dioxide ● Uranium Processing ● Hydrogen Chloride ● Ultra-Pure Silicon*
1230 – 1245	*Break*
1245 – 1420	***Non Catalytic Processes, Combustion, Gasification & Chemical Looping (cont'd)*** *Fluid Coking ● Sulfide Ore Roasting ● Gasification ● Chemical Looping*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Fluidized-Bed Combustion*** *Plant Developments ● Mechanism of Coal Combustion in Fluidized Beds ● Desulfurization ● Sulfation Models ● Nitrogen Oxides*
0930 – 0945	*Break*
0945 – 1100	***Conversion of Biomass & Waste Fuels in Fluidized-Bed Reactors*** *Introduction ● Thermal Conversion Approaches*
1100 – 1230	***Conversion Mechanisms in Fluidized-Bed Reactors*** *Fluidization and the Reacting Environment ● Material in-Feeding ● Devolatization and Volatile Conversion*
1230 – 1245	*Break*
1245 – 1420	***Conversion Mechanisms in Fluidized-Bed Reactors (cont'd)*** *"Char" Conversion and Fuel Reactivity ● Particle Attrition and Elutriation ● Comparison Between Conventional and Waste Fuels*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Operating Parameters*** *Feeding Methods ● Equivalence Ratio ● Number of Feed Points ● Bed Temperature*
0930 – 0945	*Break*
0945 – 1100	***Operating Parameters (cont'd)*** *Solid Fuel Feed Size ● Effects of Inserts Content ● Bed Depth ● Fluidizing Velocity*
1100 – 1230	***Examples of Industrial Applications*** *Fluidized Bed Combustion ● Fluidized-Bed Gasification*
1230 – 1245	*Break*
1245 – 14200	***Examples of Industrial Applications (cont'd)*** *Pyrolysis ● Fluid Bed Plasma Treatment*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

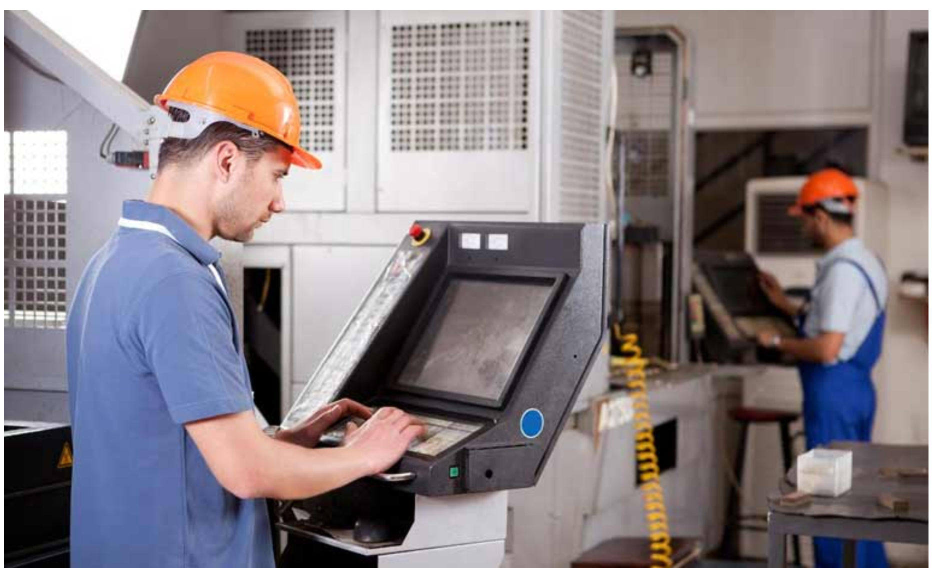
0730 – 0930	***Effects of Process Conditions on Fluidization*** *Introduction ● Interparticle Forces ● Van Der Waals Forces ● ElectroStatic Forces*
0930 – 0945	*Break*
0945 – 1100	***Effects of Process Conditions on Fluidization (cont'd)*** *Magnetic Forces ● Capillary Forces ● Solid Bridges: Sintering*
1100 – 1230	***Effect of Temperature on Fluidization*** *Effect of Temperature on Minimum Fluidization Conditions ● Effect of Temperature on Fluid-Bed Expansion and Richardson-Zaki Relationship*
1230 – 1245	*Break*
1245 – 1420	***Effect of Temperature on Fluidization (cont'd)*** *Effect of Temperature on Stability of Group A Powders ● Effect on Temperature on the Non-Bubbling Ratio*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Effect of Pressure on Fluidization*** *Minimum Fluidization Velocity ● Bubble Dynamics ● Jet Penetration*
0930 – 0945	*Break*
0945 – 1100	***Effect of Pressure on Fluidization (cont'd)*** *Entrainment and Elutriation ● Heat Transfer*
1100 – 1230	***Fluidized-Bed Scaling*** *Introduction ● Dimensional Analysis ● Combustion Scaling*
1230 – 1245	*Break*
1245 – 1345	***Fluidized-Bed Scaling (cont'd)*** *Validation of the Scaling Laws ● Application of the Scaling Laws to the Thermal Denitration Reactors at Sellafield, UK*
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-



Course Coordinator

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