

**COURSE OVERVIEW PE0105-4D**  
**Process Plant Optimization, Rehabilitation, Revamping & Debottlenecking**

**Course Title**

Process Plant Optimization, Rehabilitation, Revamping & Debottlenecking

**Course Date/Venue**

November 11-14, 2024/ Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

**Course Reference**

PE0105-4D

**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.***



Process plants are normally designed to nameplate capacities stipulated at the commencement of design. However, this can be misleading. Usually, plants have an inbuilt design margin that is not 'visible' to the owner, leading to false operating constraints that cost you lost revenue. On the other hand, bottlenecks are often introduced due to poor design or as a result of incomplete commissioning and poor control. These tend to result in your facility having reduced throughputs coupled with poor uptime. Not too long ago, it was generally conceded that a new plant could produce at least 10% more than its nameplate capacity. In some instances, owners would oversize certain pieces of critical equipment to assure this and possibly more. Today, however, we see plants being expanded too much higher capacities due to a combination of new technology and improved ways to operate and control them.



Modernization and optimization are the key prerequisites for long-term successful plant operation. Process plants are subject to permanent adjustment pressure for optimization in the areas of new or changing feed materials, products and product specifications as well as environmental regulations and demands on energy savings. Major optimization targets are, in addition to cost cutting, plant quality and capacity improvements. Retrofitting a plant is often seen as an attractive investment option compared to a new plant. Implementing new technology 'creeps' the plant capabilities at minimum cost. Plant debottlenecking for incremental capacity or product quality changes costs less than a new plant. However, revamping plant is more complex than building new one. Existing equipment needs to be analyzed, performance predicted, and integrated with new equipment and process changes. Process sequence changes also require evaluation for finding the most cost effective and reliable revamp. Existing equipment poses both challenges and opportunities in a revamp. Challenges due to limitations, both hidden and obvious, must be met. Opportunities come from using underutilized capabilities of the existing equipment.

Correctly identifying both limits and opportunities provides the lowest investment revamp. Processes include more than just equipment. Processes include specific linkages between equipment to achieve the operating plant objectives. Revamps must examine both the capabilities of the equipment and the opportunities available from changing the process sequence (or operating conditions). Correctly integrating equipment and process evaluation requires good field test data, an accurate analysis of the data, and putting together a proper team for a given revamp. No revamp is the same as any other. Every plant is different. All equipment and every process have different limits and different opportunities.

Debottlenecking is a common term for increasing overall production capacity by identifying the limiting unit operation(s) in the process and removing this limitation. Like the weakest link in a chain, maximum production capacity of any process is limited by the lowest capacity step(s) in the process, thereby producing a "bottleneck" or narrowing of total process throughput. Identifying and eliminating "bottlenecks" is a cost-effective way to obtain a sometimes-significant increase in plant overall capacity and profitability. Debottlenecking can maximize an existing plant's profitability. However, debottlenecking considerations should be taken into account during the design stage of a new facility to allow for future debottlenecking. Also, sometimes a fresh view of an operating facility can lead to debottlenecking ideas. Both revamp work and troubleshooting can be part of a plant debottlenecking effort. They share many tactics, but differ in their intent. The goal of a revamp is to improve some basic parameters such as capacity or processing efficiency. In contrast, troubleshooting merely aims to solve a problem that hampers current operation. Often, the problem exposes an opportunity for much greater gain in performance. Both revamp and troubleshooting require open-minded thinking and proficiency with engineering tools. Both often rely on test runs to diagnose problems and uncover design errors or inaccuracies in equipment ratings. However, for a major improvement in the fundamental performance of a unit, the engineer must go beyond this first level of investigation and intentionally look for the greater gain.

This course is designed to provide a good overview of the process plant optimization, rehabilitation, revamping and debottlenecking. It covers process plant overview, optimization & profitability, basic and advanced optimization tools, optimizing the design, capacity creep & plant debottlenecking, cost-effective debottlenecking strategy and action plan, optimizing process operations, process controls, optimizing reliability, management & enterprise information systems, risk management & optimization, optimizing offsites operations, utilities management, rehabilitation philosophy and mechanism, revamping strategy and options, R&D role in new product development and production capacity enhancement, safety & environmental considerations, and project management issues. The course includes many case studies that will be discussed within the 5 days. However, participants are encouraged to bring their own problems and case studies to the course. These problems should be of a non-confidential nature that can be discussed without violation of any confidentiality restrictions.

### Course Objectives

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

- Apply systematic techniques in the optimization, rehabilitation, revamping and debottlenecking of process plant
- Identify the characteristics, common misconception and scope of optimization and profitability of process plant and analyze the various optimization tools used in process plant
- Illustrate the integration of process simulation in operational analysis and implement the requirements, configuration and guidelines of optimizing the design
- Discuss capacity creep and review and improve the methodology of the cost-effective debottlenecking strategy and action plan
- Employ optimizing process operations and process controls applied in process plant
- Implement systematic techniques of optimizing process plant reliability including root cause failure analysis, logic diagrams and fault trees, materials inventory management and turnaround planning
- Recognize the role and importance of management and enterprise information systems in process plant optimization and acquire knowledge on risk management and optimization
- Employ the process of optimizing offsites operations including its design, storage facilities and inventory management
- Explain the utilities management and rehabilitation including its mechanism
- Determine the various revamping strategies and options and the R&D role in new product development and production capacity enhancement
- Discuss the maintenance, energy, utilities, environmental and safety parameters and analyze economic, planning and project management 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, sample video clips of the instructor’s actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.



### Who Should Attend


This course provides an overview of all significant aspects and considerations of process plant optimization, rehabilitation, revamping and debottlenecking for process engineers, planning engineers, plant engineers, production engineers, operations engineers, project and maintenance engineers. The course is also essential for directors, managers, investors, R&D executives and other technical staff involved in the process plant optimization, revamping or debottlenecking.

### 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: -

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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.

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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. Manuel Dalas, PEng, MSc, BSc, is a Senior Process Engineer with over 25 years of industrial experience within the Oil & Gas, Refinery, Petrochemical and Refinery industries. His expertise widely includes in the areas of Pressure Relief Valves, Pressure Vessels Maintenance & Operation, Piping Support, Ironworks, Rotating & Static Equipment (Pumps, Valves, Boilers, Pressure Vessels, Tanks, Heat Exchangers, Bearings, Compressors, Pipelines, Motors, Turbines, Gears, Seals), Crude Distillation Process, Saturation Gas Process Technology, Crude Dehydration & Desalting, Crude Stabilization Operations, Process Plant Performance & Efficiency, Heat Exchangers & Fired Heaters Operation & Troubleshooting, Process Plant Optimization, Revamping & Debottlenecking, Process Plant Troubleshooting & Engineering Problem Solving, Mass & Material Balance, Oil & Gas Processing, Oil Field Operation, Process Plant Operation & Troubleshooting, Hydrogen Sulphide Stripping, Crude Oil De Salting Process, Gas Conditioning, NGL Recovery & NGL Fractionation, Flare Systems, Pre-Fabrication of Steel Structure, Alloy Piping Pre-Fabrication, Heat Exchangers, Vertical Columns/Pressure Vessels, Distillation Column, Steel Structures, Construction Management, Building Structures and Electrical-Mechanical Equipments. Further, he is also a well-versed in Materials Management, Inventory Control and Workplace Housekeeping. Currently, he is the Technical Consultant of the Association of Local Authorities of Greater Thessaloniki where he is in-charge of the mechanical engineering services for piping, pressure vessels fabrications and ironwork.**

During his career life, Mr. Dalas has gained his practical and field experience through his various significant positions and dedication as the **Technical Manager, Construction Manager, Project Engineer, Production Engineer, Construction Engineer, Consultant Engineer, Technical Consultant, Safety Engineer, Mechanical Engineer, External Collaborator, Deputy Officer** for various companies including the Alpha Astika, Anamorfosis Technical Firm, EKME, ASTE, Elof Consulting and Hypergroup.

Mr. Dalas is a **Registered Professional Engineer** and has a **Master's degree in Energy System** from the **International Hellenic University** and a **Bachelor's degree in Mechanical Engineering** from the **Mechanical Engineering Technical University, Greece** along with a **Diploma in Management & Production Engineering** from the **Technical University of Crete**. Further, he is a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership and Management (ILM)**, a **Certified Project Manager Professional (PMI-PMP)**, a **Certified Instructor/Trainer**, a **Certified Energy Auditor for Buildings, Heating & Climate Systems**, a **Member of the Hellenic Valuation Institute** and the **Association of Greek Valuers** and a **Licensed Expert Valuer Consultant** of the **Ministry of Development and Competitiveness**. He has further delivered numerous trainings, courses, seminars, conferences and workshops internationally.

### 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® (Howard 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 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	<i>Registration &amp; Coffee</i>
0800 – 0815	<i>Welcome &amp; Introduction</i>
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Process Plant Overview</b> <i>Overview of Production Operations • Process Development &amp; Innovations • Feedstock &amp; Raw Material Availability &amp; Flexibility • Integration of Primary, Intermediates &amp; Final Products • Integration of Core Unit &amp; Processing Plants • Methodology of Name-Plate Capacity Development</i>
0930 – 0945	<i>Break</i>
0945 – 1115	<b>Optimization &amp; Profitability</b> <i>Optimization Characteristics • Common Misconception • Maxima &amp; Minima • What can Optimization Achieve • The Pareto Principle • Concepts of Profitability • Operational Economics • Investment &amp; Enterprise Economics</i>
1115 – 1230	<b>Basic Optimization Tools</b> <i>Graphical Solutions • Analytical Methods &amp; the Incremental Method • Breakeven Analysis</i>
1230 – 1245	<i>Break</i>
1245 – 1420	<b>Advanced Optimization Tools</b> <i>Linear Programming (LP) • Quadratic Programming (QP) • Non-Linear Optimization Techniques • Global &amp; Local Optima</i>



1420 – 1430	<b>Recap</b> Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day One

**Day 2**

0730 – 0900	<b>The Integration of Process Simulation in Operational Analysis</b>
0900 – 0915	Break
0915 – 1100	<b>Optimizing the Design</b> Configuration Optimization • Maximizing NPV & Total Cost • Utilities Pinch Technology • Integrating Unit Performance • Integer Programming (IP)
1100 – 1230	<b>Capacity Creep &amp; Plant Debottlenecking</b>
1230 – 1245	Break
1245 – 1420	<b>Cost-Effective Debottlenecking Strategy &amp; Action Plan</b>
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Two

**Day 3**

0730 – 0900	<b>Optimizing Process Operations</b>
0900 – 0915	Break
0915 – 1100	<b>Process Controls</b> Process Control Fundamentals • Feed-back & Feed-forward Controls • DCS & Advanced Controls • Off-line Optimization • Process Analyzers • Multivariable Process Control • Inferential Controls • Dynamic versus Steady-State • Statistical Process Control
1100 – 1230	<b>Optimizing Reliability</b> Route Cause Failure Analysis • Logic Diagrams & Fault Trees • Materials Inventory Management • Turnaround Planning
1230 – 1245	Break
1245 – 1420	<b>Management &amp; Enterprise Information Systems</b>
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Three

**Day 4**

0730 – 0900	<b>Risk Management &amp; Optimization</b>
0900 – 0915	Break
0915 – 1100	<b>Optimizing Offsites Operations</b> Offsites Design • Storage Facilities Operation • Blending Optimization • Inventory Management
1100 – 1230	<b>Utilities Management</b>
1230 – 1245	Break
1245 – 1420	<b>Rehabilitation Philosophy &amp; Mechanism</b>
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Four



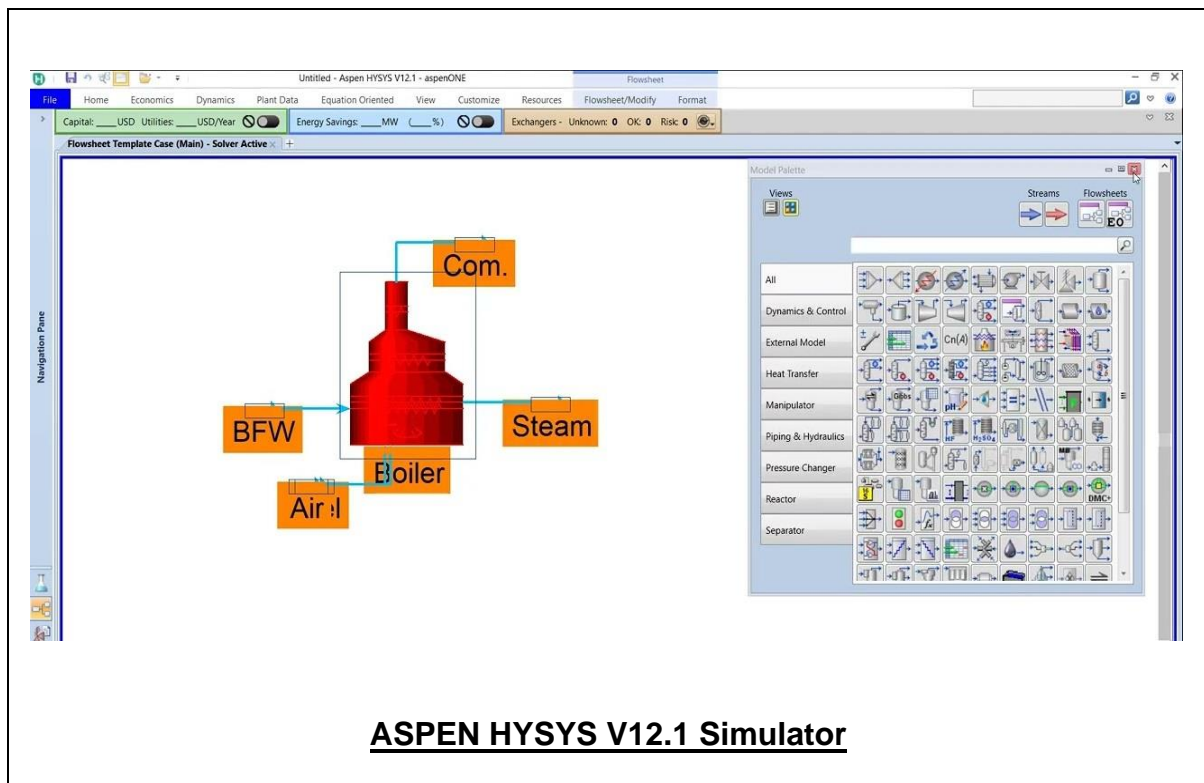


### Day 5

0730 – 0900	<i>Revamping Strategy and Options</i>
0900 – 1045	<i>R&amp;D Role in New Product Development &amp; Production Capacity Enhancement</i>
1045 – 1100	<i>Break</i>
1100 – 1230	<i>Maintenance, Energy, Utilities, Environmental &amp; Safety Parameters</i>
1230 – 1245	<i>Break</i>
1245 – 1345	<i>Economic, Planning &amp; Project Management Issues</i>
1345 – 1400	<i>Course Conclusion</i>
1400 – 1415	<b>POST-TEST</b>
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch &amp; End of Course</i>

### **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 state-of-the-art simulators “ASPEN HYSYS” simulator.



### **Case Studies & Exercises**

Based on the time allowed, some or all the following case studies will be discussed within the course: -

- Optimizing a Polyethylene Plant
- Optimizing a Polypropylene Plant
- Debottlenecking Ethylene & Propylene Plant
- Revamping Cryogenic Gas Processing Plants
- Debottlenecking the Rotary Hearth Furnace





- Revamping of Hot Strip Mill
- Revamping, Rehabilitation and Debottlenecking of Fertilizer Plant
- Rehabilitation of Cement Plant
- Revamping Oil Refinery
- Rehabilitation of Filter Equipment of Phosphoric Acid Plant
- Debottlenecking and Rehabilitation of Urea Plant
- Revamping Automation Systems
- Revamping of Control and Safety Systems
- Revamping Ammonia Plant
- Revamping Multi-site Hydrotreater
- Revamping Phosphoric Acid Plant
- Debottlenecking Magnesium Plant
- Debottlenecking an Upstream Oil Production Facility
- Revamping & Rehabilitation of Process Heater & Furnace
- Debottlenecking of Aromatics Extraction Plant
- Debottlenecking FCC Unit

Participants can select specific case studies to be discussed or they can even bring their own case studies to discuss them in the course.

### **Course Coordinator**

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