



PE023: Process Plant Optimization, Revamping & Debottlenecking

Training Description:

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 intensive training program 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.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ Apply systematic techniques in the optimization, 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

Training Designed for:

This course is intended process plant optimization, 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.

Training Requirement:

“Hand’s on practical sessions, equipment and software will be applied during the course if required and as per the client’s request.”

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

- ❖ Pre-Test
- ❖ Introduction
- ❖ Process Plant Overview
 - Overview of Production Operations, Process Development and Innovations, Feedstock and Raw Material Availability and Flexibility, Integration of Primary, Intermediates and Final Products, Integration of Core Unit and Processing Plants, Methodology of Name-Plate Capacity Development
- ❖ Optimization & Profitability
 - Optimization Characteristics, Common Misconception, Maxima & Minima, what can Optimization Achieve, The Pareto Principle, Concepts of Profitability, Operational Economics, Investment & Enterprise Economics
- ❖ Basic Optimization Tools
 - Graphical Solutions, Analytical Methods & the Incremental Method, Breakeven Analysis
- ❖ Advanced Optimization Tools
 - Linear Programming (LP), Quadratic Programming (QP), Non-Linear Optimization Techniques, Global & Local Optima
- ❖ The Integration of Process Simulation in Operational Analysis
- ❖ Optimizing the Design
 - Configuration Optimization, Maximizing NPV & Total Cost, Utilities Pinch Technology, Integrating Unit Performance, Integer Programming (IP)
- ❖ Capacity Creep & Plant Debottlenecking

DAY TWO:

- ❖ Cost-Effective Debottlenecking Strategy and Action Plan
- ❖ Optimizing Process Operations
- ❖ Process Controls
 - 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
- ❖ Optimizing Reliability
 - Route Cause Failure Analysis, Logic Diagrams & Fault Trees, Materials Inventory Management, Turnaround Planning
- ❖ Management & Enterprise Information Systems

- ❖ Risk Management & Optimization
- ❖ Optimizing Offsites Operations
 - Offsites Design, Storage Facilities Operation, Blending Optimization, Inventory Management

DAY THREE:

- ❖ Utilities Management
- ❖ Rehabilitation Philosophy and Mechanism
- ❖ Revamping Strategy and Options
- ❖ R&D Role in New Product Development and Production Capacity Enhancement
- ❖ Maintenance, Energy, Utilities, Environmental and Safety Parameters
- ❖ Economic, Planning and Project Management Issues

DAY FOUR & FIVE:

- ❖ Practical Sessions
- ❖ 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 Conclusion
- ❖ POST-ASSESSMENT and EVALUATION

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.



Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:

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