Introduction to Energy Optimization for the Processing and Power Industry

Introduction

The success of every company depends of each employee's understanding of the key business components. Employee training and development will unlock the companies' profitability and reliability. When people, processes and technology work together as a team developing practical solutions, companies can maximize profitability and assets in a sustainable manner. Training and development is an investment in future success - give yourself and your employees the keys to success

It is strategically important that your operations team understands the fundamentals of energy optimization concepts. This is the difference between being in the best quartile of operational ability and being in the last quartile. There is vast difference in the operational ability of operating companies and most benchmarking studies have confirmed this gap in operational abilities.

Whether you have a team of new or seasoned employees, an introduction or review of these concepts is very beneficial in closing the gap if you are not in the best quartile, or maintaining a leadership position. Most studies show that a continuous reinforcement of best practices in operational principles is the most effective way to obtain the desired results. Training and learning should be an on going continuous life long goal.

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Course Objective

This course will guide the participates to develop key concepts and techniques for petrochemical processes and economics. These key concepts can be utilized to make operating decisions that can improve your unit's performance.

Many aspects of petrochemical operations and management can be improved including, product recoveries, purities and energy utilization, and safety. This cannot be achieved without first an understanding of basic fundamental principles of design and operation. These principles need to be understood in advance of operating and trouble shooting a process unit operation for the manager or problem solving to be effective.

This seminar focuses on the core building blocks of the energy optimization and economics. This program will emphasize petrochemical process unit operation fundamentals, safe utilization of these fundamentals by operations, engineering, maintenance and support personnel.

The goal of the course would be to refresh the knowledge of those who have a basic understanding of energy optimization and to build a foundation to those who are new to energy optimization fundamentals. This course is an introductory course for these topics – for an advance course considers attending our Advanced Fundamentals Course.

Outline

1. Introduction to Petrochemical Key Concepts

    A. Overview of the Petrochemical Industry
    B Chemistry of the Petrochemical Industry
    C. Safety in the Petrochemical Industry

2. Overview of energy efficiency and the theory of optimization

    A. Key energy performance indicators used by companies
    B. EORT Models for energy efficiency optimization – parametric
    C. Develop energy efficiency model – EORT
    D. Identifying energy loss areas
    E. Example/Class Room Exercise: Energy efficiency evaluation technique
    F. Case Studies: 1) Monitoring energy efficiency for a complex refinery/petrochemical/fertilizer plant 2) Optimizing energy efficiency of the total system

3. Impact of equipment modernization on energy efficiency

    A. Fired heaters – Natural draft heater vs. APH vs. CI-Glass combination APH
    B. High efficiency pumps
    C. Model based performance monitoring – centrifugal compressor
    D. Steam, Gas turbine performance models

4. Advanced Process Control for enhancing heater efficiency

    A. Performance monitoring of fired equipment
    B. Aging effect and maintenance cost on energy efficiency of equipment
    C. Economic evaluation and selection of alternates
    D Impact of process mix/technology on energy efficiency and profitability

5. Modernization of Distillation process and downstream processes

   A. Packed towers vs. conventional tray towers
   B. Optimize process mix for cost reduction and profit maximization
   C. Cogeneration and its impact on energy efficiency
   D. Trigeneration
   E. Case Studies: 1) Cost-benefit analysis of specific process 2) High efficiency packing

6. Catalytic Conversion Processes

   A. Impact of catalyst on process performance
   B. Catalyst evaluation methods
   C. Optimize energy efficiency of catalytic processes
   D. Cost – Benefit analysis of catalyst type
   E. Selection of catalyst for the process (KHDS/NHDS/NHDS)
   F. Fluid catalytic cracking – catalyst – conversion vs. cost

7. Heat Recovery Vs Thermal Efficiency of Heat Transfer Systems

   A. High efficiency heat exchangers and their evaluation
   B. Pinch technology concept – Heat exchanger train
   C. Heat exchanger – Optimum cleaning/tube replacement cycle
   D. Thermal engineering concept – Optimum heat recovery
   E Condenser – Fouling and condensing efficiency evaluation
   F. Case Study: Process Integration
   G. Case Study/Exercise: Optimize heat recovery process

8. Fired Heaters, Boilers, Waste Heat Boilers

   A. Energy efficiency evaluation methods / Direct and Indirect
   B. Energy loss control in Heater / boiler operation
   C. Case study / Examples
   D. Energy efficiency Demo for a fired heater / boiler
   E. Impact of air quality on efficiency
   F. Energy efficiency enhancement techniques.
      – conventional – non conventional

9. Power Plant Optimization

   A. Energy efficiency evaluation of power plants
   B. Load optimization
   C. Process mix

10. Energy Loss Control

   A. Plant fuel and loss, Steam loss, Power loss
   B. Reduce losses in pumps, fan, pipe and duct systems
   C. Matching the pumps and fans characteristics to the process requirements
   D. Total hydrocarbon loss control
   E. Flare gas loss – Control schemes
   F. Gas balance
   G Loss control models

11. Process Integration – Refinery - Petrochemical – Fertilizer - Power Plant to Enhance Energy Efficiency

   A. Design integrated plants for maximum efficiency
   B. Identify energy saving opportunities by energy audit
   C. Advanced process control schemes
   D. Case Study: Cost benefit evaluation

12. Non Conventional Energy Systems

   A. Linking conventional energy to non-conventional energy
   B. Solar/Wind/Bio energy – Opportunities
   C. Energy data base management
   D. Energy economy calculation for various schemes and identifing alternatives
   E. Energy saving in pumps and fans through Variable Speed Drives (VSD)

13. Conclusions

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Who Should Attend:

- People who are making day to day decisions regarding operation, design, and economics of processing and power plants;

    1. 1st Line Operations personnel,
    2. Operation Supervisors,
    3. 1st Line Maintenance personnel,
    4. Maintenance Supervisors,
    5. Senior Plant Supervisors,
    6. Operations Engineers
    7. Process Support Engineers,
    8. Design Engineers,
    9. Cost Engineers

- Attendance at this course will be beneficial to support personnel such as

    1. Environmental professionals,
    2. Accountants,
    3. Business managers,
    4. Administrative and legal staff,
    5. Sales and marketing personnel
    6. Insurance representatives,
    7. Personnel managers,
    8. Financial professionals, and
    9. Government officials.

- Ideal for veterans and those with only a few years of experience who want to review or broaden their understanding in Processing Plant Operations.

- Other professionals who desire a better understanding of subject matter

What you can expect to gain:

- An introduction of energy operations, processes and economics
- Gain an understanding of how equipment effects energy optimization
- Gain an understanding of catalyst and energy interaction
- Gain an understanding of energy benchmarking and KPI
- Gain an understanding of where energy is lost in the processing and power industries
- Gain an understanding of power plant optimization
- Gain an understating of process economics and margins

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