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Profitability / Energy Efficiency Improvement

By Jerry Lacatena

Every facility owner is very interested in maximizing their profits. With energy consuming a substantial portion of a petroleum refinery's or petrochemical plant's operating costs, the range of effort required to address this can vary significantly. At Carmagen Engineering, Inc. (CEI), we're committed to the cause of improving energy profitability/efficiency in a cost effective manner. We typically advise our clients not to jump into time and resource-intensive programs head first, but rather to take a phased approach. We first focus on a few major opportunity areas based on our experience to reap the "low cost/no cost" opportunities first, and also identify/prioritize areas that are worthwhile for more detailed analysis.

Our program is delivered through a streamlined four-step process utilizing a team led by an energy management expert, supported by a fired equipment or heat exchanger specialist if needed. Client participation throughout the process is a key ingredient to its success, while at the same time increasing the capabilities of client staff. The four steps are:

SCOPE: This first step sets the stage by quantifying expected results, and then defining the scope, objectives, boundaries, constraints, plans, and schedule for the next steps. Quite often, immediate action can be taken on some items identified in this first step and begin seeing benefits, which also help fund subsequent steps.

- Review performance history, understand current operations
- Compare performance to Benchmarks
- Quantify challenging yet realistic goals and targets
- Define cost-effective opportunity areas within the plant
- Identify team members, estimate costs, and develop schedules for subsequent steps

ASSESS: Identifying and sharing Best Practices and Key Performance Indicators (KPI's) represent the heart of both the four-step process and the crucial Assessment Step. We will help the client focus attention on areas identified in Step One that represent the greatest opportunities. These typically include:

- Improve operating efficiency of fired heaters, distillation units, and steam systems
- Maximize use of heat at the lowest cost-effective levels

Work Highlights

FCCU

- Completed a process design basis through Mechanical-Specification for FCC unit regenerator flue gas system revamp.

Hydrotreating

- Provided remote technical assistance for assessing catalyst implications to multiple hydrotreaters and a reformer associated with processing alternate sour crude for a refiner in Central America.

Materials

- Conducted an evaluation of the need for a program of Positive Materials Identification (PMI) on existing refinery facilities, and developed a program of PMI for new equipment and maintenance activities. Materials of construction for the units were reviewed and equipment that should be subject to PMI was identified. The study identified two types of equipment where PMI is recommended: equipment where alloy is specified and installed, and carbon steel equipment where low Si grades of carbon steel may suffer increased sulfidation.

Process Development

- Provided process and mechanical technology development support for a chemical company's novel commercial design involving a fluid bed-type conversion process.

PLAN: In Step Three, engineers assist the plant in the preparation of a high-yield implementation plan that is built on the portfolio of attractive opportunities identified in the assessment step.

- Set priorities by comparing savings to estimated costs for each opportunity identified in Step Two
- Package results, review with plant management, and gain approval to proceed with the implementation of operational improvements and potential facility modifications

IMPLEMENT: While consulting assistance may continue through implementation, our engineers turn over leadership to the client's organization at the beginning of Step Four, when they:

- Support plant management to develop performance metrics, targets, and milestones against which to gauge implementation progress

The level of effort required depends on the complexity of the systems involved. Once this initial phase is done, the path forward depends on the findings, technical issues, extent of options, and justification to pursue investigations in a more detailed manner. This may involve:

- Use of more sophisticated and focused energy optimization/studies
- Development of specialized optimizer tools/software
- Address significant technical issues, such as fouling or other factors
- Feedstock variation and product slate considerations
- More effective operations and procedures
- Address conceptual estimating costs of options for evaluation
- Assist in the development of capital improvements/design modifications tailored to meet specific objectives

A subsequent newsletter article will discuss an example of an energy efficiency improvement study that was done for a client in the Far East.

About the Author

Jerry Lacatena has over 35 years of process engineering experience in a broad range of design applications and technologies. He is a proficient and organized multi-tasker, having extensive plant design experience on numerous revamp and grassroots projects throughout the world, with projects ranging from feasibility studies, technology evaluation, FEED, EPC development, to plant performance testing. Jerry has excellent presentation, communication, coordination, and interpersonal skills utilized to develop strong working relationships with team members, clients, vendors, sub-contractors, and technical licensors.

Please contact Jerry Lacatena, Process Department Manager (jlacatena@carmagen.com) if you'd like more information on Carmagen's expertise in this area. Carmagen Engineering, Inc. is an engineering consulting company with experienced staff that can support clients' efforts associated with energy management and profitability improvement activities.

