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## Revamp Screening Studies

By Jerry Lacatena

In the early phases of revamp project conceptual engineering, it is usually beneficial to perform screening-type studies to explore various approaches or potential options in order to achieve the desired objectives. It is also advantageous to understand the salient factors/drivers that may validate facilities upgrade strategy. Further, such activities can quickly reveal the complexity, potential ramifications, and preliminary economic differentials for implementing a specific option or change relative to other paths.

Revamp screening studies could apply to a particular existing system, a refinery process unit, or an entire processing complex. This brief article discusses some of the general considerations associated with this kind of activity. This is not an all-inclusive discussion, since the focus of a screening study may be flexibly driven by circumstances, owner-operator needs, and/or timing requirements.

Fundamental to engineering screening efforts is to establish alignment/clarity on the objectives of the screening task at the beginning, plus the availability of any technical performance and economic criteria that are pertinent to decision-making. Revamp projects may be targeting one or a combination of the following objectives:

- Increase profitability or return on investment (ROI)
- Push performance targets, debottlenecking, or higher capacity
- Incorporate new catalyst, if applicable, or novel technological improvements
- Increase process flexibility (e.g., broader range of feedstocks, longer run length, more resilient to contaminants vs. treating, turndown, etc.)
- Address environmental factors (e.g., reduce emissions or waste disposal)
- Improve safety
- Address governmental mandates and regulations
- Improve unit reliability, on-stream factor, run length, etc.
- Minimize capital investment
- Other

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- Course 607, *Design and Maintenance of Aboveground Atmospheric Storage Tanks*, April 9 - 11, 2013  
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### Work Highlights

#### Fired Equipment / Heat Exchangers

- *Software simulations were made of a fired heater installed in an existing refinery crude oil distillation unit. The objective was to provide the refinery with a basis for proceeding with a revamp project to increase the heater's fuel efficiency. With the results obtained, the refinery was able to develop the technical specification needed to solicit bids from fired heater vendors for the detailed engineering needed to achieve the refinery's objectives.*

#### Mechanical Engineering

- *Mechanical Engineering design audits were made of the technical specifications prepared by others for new delayed coker drums. One case was for a new grassroots unit, and the other was for replacement drums in an existing unit. In both cases, numerous recommendations were made to modify the specifications to improve the overall in-service mechanical reliability of the drums.*

#### Process, Operations & Safety

- *Providing licensing consultation and management support with particular focus on hydroprocessing and catalytic dewaxing technology areas.*

A proven approach to achieving a successful revamp screening study is to have an interactive owner-operator/engineering team with guidance from “fit for purpose” technical experts, who are experienced in doing this kind of work and have practical design and operations expertise. Screening studies can be brief, or extend over a few months, depending on the scope, complexity of the endeavor, availability/volume of data, and priorities.

Technical screening differs somewhat from a Cold Eyes Review (CER), where staff who were uninvolved with the original work reviews the technical documentation that was prepared by others in a very limited timeframe. A CER usually takes only a few days to perform after work by others is done. A CER typically raises questions, provides observations and commentary to be addressed later by the owner. Performing a CER can also be valuable, but this would typically occur after a particular basis, design, or package is already available.

The history of any prior problems, modifications made to address them, and their outcome should generally be provided and clarified upfront, as appropriate. Background documentation on as-installed facilities for units or systems that are involved is usually essential, such as the design basis, heat and material balances, equipment specifications/design conditions documentation, inspections, and operating data, etc.

Electronic operating data captured from the DCS system is preferred, since it can be trended, plotted, and analyzed over specific timelines and targeted ranges of operation. Such diagnostics can reveal some unexpected findings, highlight limitations, dispute earlier perceptions about the real issues involved, and possibly impact the initial revamp basis.

Once sufficient familiarity with the pertinent unit design and operation has been obtained, brainstorming and investigation of potential revamp concepts to define screening options begins. This includes assessing their pros and cons, uncertainties, estimated costs, etc., and then ultimately striving to clarify the field of options that best achieve objectives. It is important to document the screening findings, so that the focus of resources is on those options that are preferred for future study in the next phase of engineering study/economics review. Screening reports usually should also present all options considered (even some that were discarded early), the rationale for preferences, as well as any assumptions agreed upon. Adding considerations for moving forward might also be included, such as highlighting if some additional data collection/test runs, licensor or vendor information, or specific area estimating is recommended later.

At this stage unless there is a truly obvious path forward, more rigorous studies may follow one or more of the “higher preference” technical options to scope out major modifications with more detail, etc. If capital is limited, a lower capital investment approach might also be included for comparison. It is not unusual to see a revamp design basis evolve, and be refined over the course of screening and even later design studies. But changes need to be managed and documented along the way to confirm alignment.

Carmagen Engineering, Inc. (CEI) offers technical process expertise as well as multi-discipline equipment and project management staff to assist clients with consulting on virtually all types of refinery unit revamp projects requiring screening studies.

#### 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.*

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