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Value Engineering Workshop on a Major Industrial Project In Southern Thailand



by Ir. Jiunn S. Tan

PROJECT BACKGROUND

The HTY project [1] is an industrial factory plant located in the Southern Region Industrial Estate (SRIE) on an approximate plot size of 210,335m² in Songkhla province, Thailand. The new industrial factory plant is composed of three major building categories: ISBL (Production Activity Buildings), OSBL (General Activities Buildings), and Others (Raw water treatment station, waster water treatment plant and gas washing tower station).

ISBL Buildings Cluster is composed of Building No. 480-Latex Unloading Area, Building No. 481-Latex Tanks Area, Building No. 482-Slurry Building, Building No. 483-Process Building, Building No. 484-Carbon Black Storage Building and Building No. 485-Finished Product Warehouse. All buildings are architecturally composed together in the most effective juxtaposition and consecutive configurative layout format, with the proper selection of construction materials and systems to best suite and satisfy the most logistical flow of the plant operation process, function and design enhancements of natural lighting and ventilation, and optimal construction costs and time.

The central spine of the building cluster lays the key industrial plant operation process, which are the Outdoors Latex Unloading Area (starting off at the furthest eastern corner of the overall ISBL buildings complex) in direct physical adjacency with the Latex Area, then the four storey Slurry Building, Carbon Black Storage Building, three storey Process Building, then through the external Forklift Movement Area transporting the finished product to the Finished Product Warehouse for proper storage at the end of the process. The supporting facilities located around the peripheral with a direct link and accessibility to the main factory ISBL operation process spine are the following OSBL Buildings, namely, Building No. 150-Chemical & Physical Lab, Building No. 491-Offices & Lockers, Building No. 490-Electrical Substation 1 and BL-21-Main Electrical Building.

PURPOSE

The purpose of this workshop [2] is to describe the value engineering (VE) system for the HTY project. The primary objective of the system is to facilitate cross-functional learning, assist in adding value to the HTY project, avoid unnecessary expenditure, and provide a systematic, function based approach to improve the overall project execution while optimising costs without sacrificing safety or quality.

DEFINITION OF VALUE ENGINEERING (VE) AND BACKGROUND

VE is a creative and organised effort which analyses the requirements of a project for the purpose of achieving essential functions at the lowest total costs over the life of the project.

Table 1

N°	Levers Family	Lever Title	Lever Action	Bidder Technical Offer/ Clarification	Cost Saving (Thai Baht)
20	Fire Specification	Replace CS by GRP for fire water network	1) Contractor confirmed there is no specific requirement by Thai regulations related to FW piping material. 2) Contractor to prepare MTO for U/G HDPE piping. 3) Evaluate construction constraints (Jan.11th Rev.)	Contractor studied the replacement of U/G CS by U/G HDPE piping for the fire water network.	6,270,000
290	Building Specification	Sprinkler System Pump House - 127: Steel structure bldg on pad foundation (no piling), tank foundations on inverted T-pad footing (no piling).	1) Employer confirmed that this modification is acceptable and that the contractor shall proceed/implement this modification. (Jan.10th Rev.)	Contractor proposes an alternative to have Bldg 127 structure in reinforced concrete and to modify the foundation design without piling. Employer agreed on Jan.10th to implement this item.	5,670,000
295	Building Specification	Latex Unloading Area - 480: RC slab on grade 250mm thick (no piling).	1) Employer confirmed that the contractor shall proceed and implement this modification. (Contractor to verify and confirm if piles are not required due to diff settlement). (Jan 10th Rev.)	Contractor initially designed Bldg 480 with piles but has revisited the design since then and can cancel these piles. Employer agreed on Jan.10th to implement this item.	4,810,050
298	Building Specification	ISBL buildings 482 and 483 columns to be in concrete instead of steel	1) Building Construction S/C should still confirm if there is any impact. 2) If there is no schedule impact or if there is sch. saving, employer agrees to implement this item. 3) If there is schedule impact, contractor to come back to employer. (Jan.10th Rev.)	ISBL ITB documents calls for BL 482 and 483 structures to be in steel. Contractor proposes to have these buildings structure in reinforced concrete. In addition to the structural material, this will reduce significantly the fire proofing cost. Without cost impact on the schedule, employer agreed on Jan.10th to implement this item.	14,169,750
300	Building Specification	Calculate civil quantities saving if 3t/m ² is taken instead of 10t/m ² design criteria for Bldg 135	1) Employer confirmed that only one truck will be on Bldg 135 slab at the same time. Since Bldg 480 slab design criteria is 3t/m ² , employer and contractor agree that this 3t/m ² criteria can be used for Bldg 135 design. Contractor to proceed accordingly. (Employer to confirm this value when trucks characteristics are known) (Jan.10th Rev.)	Contractor deems that this design criteria is leading to excessive concrete quantities but need employer to determine the adequate revised design criteria which depends on the plant operation philosophy such as the number of trucks at the same time in this building. Contractor provides here the potential cost saving if 5t/m ² was considered.	6,294,200
111	Process Technology change	Replace SS316L by CS for DWE WW tank piping and use pulled bends for the DWE WW piping	1) P&ID marked up 2) Prepare associated MTO (piping) (Jan.12 Rev)	Contractor shows on P&ID mark up (VE#111-1) and on "EL VE#111-2 Equipment List" the piping and equipment concerned by this lever.	5,445,000
170	Process Technology change	Manual valves on water circuit do not need to be ball valves (water and air circuits).	1) Mark-up P&ID were prepared 2) Prepare associated MTO (piping) (Jan.11th)	Contractor confirms that manual valves on the water and air circuits are changed from ball valve to gate valve. P&ID markups (VE#170-1 and VE#170-2) are attached for employers' review.	11,132,000
174	Process Technology change	Eliminate carbon monoxide sensors on the DWE vent	1) LIC confirmed that the sensors and associated analysers can be eliminated. LIC shall provide relevant documents to employer for their review and decision. 2) It will take some time before EMP can confirm its implementation. 3) Prepare corresponding markup P&ID's and associated MTO (Instrumentation). (Jan. 12th).	Contractor hereby provides the P&ID markup (VE#174-1) for this lever.	4,950,000
238	Electrical Specification	Reduce Building 490 from two floors to one by locating the secondary transformers outside	1) Contractor confirmed outdoor oil type transformers are cheaper than dry type. 2) Employer and contractor agree that this lever should be studied (Roof above transformer, fire walls are required) in conjunction with lever 188. Corresponding MTO (civil, electrical) of the optimum solution to be developed. (Jan.12th)	Contractor confirms that Building 490 can be reduced from two to one floor. 1) To reduce Building 490 to one floor level, all LV switchgears located in second floor will be moved to ground floor level and the secondary transformers will be moved outdoor to a transformer yard area. 2) All outdoor transformers will be changed from dry-type cast resin to oil type. Furthermore, the transformers shall be kept under roof and separated by fire walls. 3) Revised electrical room dimensions (50mx13.5m) and transformer yard area dimensions (39mx5m) are preliminary estimations only.	18,891,000

Through a group investigation, using experienced, multi-disciplinary teams, value and economy are improved through the study of alternate design concepts, materials and methods without compromising the functional and value objective of the client. The Society of American Value Engineering (SAVE) was formed in 1959 as a professional society dedicated to the advancement of VE through a better understanding of the principles, methods and concepts involved. Now known as SAVE International, the latter has grown to consist of over 1,500 members and currently has over 350 active Certified Value Specialists (CVS) in the United States.

REASONS FOR POOR VALUE

The following is a partial list of the reasons for poor values:

- Lack of and/or poor coordination among designers
- Failure to network with customer which leads to a poor definition of needs and wants
- Design based on habitual thinking or mistaken belief
- Insufficient time for project formulation and/or design
- Failure to utilise the latest technology
- Negative attitude
- Poor communication in developing project scope
- Lack of consensus among project stakeholders with regards to project scope
- Outdated or inappropriate design standards
- Incorrect assumptions based on poor information
- Fixation with previous design concepts

ROLES AND RESPONSIBILITIES [2]

Client and Client's Representative

The employer and its representatives for the HTY project are responsible for defining the VE exercise objectives, the criteria on which he wants the Value Improving Practice (VIP) to be evaluated, and which project constraints are fixed and which ones are variable.

Contractor

The contractor project manager of the HTY project is responsible for the implementation of the VE System, the management and the control of this workshop.

VE Lead Facilitator

He is responsible for the content of this workshop. He defines the various steps of the overall VE exercise and defines the agenda and the participants of the various meetings and workshop. He familiarises all users with the VE Process.

VE Data Base Manager

Controls access to the VE ideas stored in the database. Maintains the system, and maintains the integrity and confidentiality of the system and its content. He familiarises all users with the VE Process. The authorising manager may be, or can be designated by, the project manager.

Project or Discipline/Department Managers/Project Technical Lead

Arrange for the collection and analysis of potential VE ideas in a systematic manner. Project managers are required to arrange this activity at an appropriate time with respect to the schedule during execution. Project managers shall determine the frequency of follow up meetings based on the specific project requirements and need. The project technical lead will normally be responsible for gathering the information needed for the workshop. Also, the project technical lead is generally expected to be the most knowledgeable on the cost estimate content and basis. This is important when determining if an idea represents savings, or is already the basis of the estimated cost. For the execution of the BED works, the estimating project lead will have significant input when there is a need for the order of magnitude estimates to quantify ideas.

Subject Matter Experts

Assists in the analysis of VE ideas when they are collected if required; evaluate the potential VE residing in the database and determine whether it is to be stored or rejected; validate a VE idea periodically.

EXAMPLE OF VE WORKSHOP

Table 1 shows the partial list of selected levers approved by the client for implementation with significant savings and negligible schedule impact.

CONCLUSION

In the final analysis, VE is not only beneficial, but essential because:

- The functionality of the project is often improved and produces tremendous savings, both for the initial and lifecycle cost.
- A "second look" at the design produced by the architect and engineers gives the assurance that all reasonable alternatives have been explored.
- Cost estimates and scope statements are checked thoroughly to ensure that nothing has been omitted or underestimated.
- Assures that the best value will be obtained over the life of the project. ■

Note:

The author is a practising professional engineer with a major international contractor/consultant company in the oil and gas industry and currently posted in Bangkok.

REFERENCES:

- [1] Technip, Technical Proposal for HTY Project by Pierre E Crouzier, March 2011
- [2] Technip, Value Engineering Procedure for HTY Project by Robert Clark, March 2011