VE RECTIFIES DESIGN BASIS

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INTRODUCTION

This paper illustrates an interesting situation of a Value Engineering (VE) study. At the start of the VE study, the concept of the original design appeared to be investigated in detail by the owner and his consultant. Therefore, any further study seemed to be an unjustified expense. However, because the writer believes in the VE techniques and methodology, the VE study continued.

PROJECT DESCRIPTION

The project was to build a continuous steel slab caster, an addition to an existing steel plant complex. The new caster was to be supplied with molten steel. Naturally, it would have been ideal to have the new facility located near the furnace to supply the molten steel. However, due to the lack of space in this plant complex, such an ideal situation was not possible. Instead, the new caster was built on a nearby green-field property outside the boundary of the existing plant complex. As a result, the molten steel is presently being transported from the furnace (in the existing plant) to the new caster.

SUBJECT OF VE STUDY

The molten steel is usually transported inside covered ladles; which were designed specifically for the project. These ladles are supposed to be transported from the furnace to the caster. The subject of the VE study then was how should these ladles be transported, by road or by railroad track?

ORIGINAL DESIGN

Based on the study performed by the consultant and supported by data collected by the owner's engineering staff, a *"haul road"* was the chosen concept. An aggregate road was preferred to a hard surface (paved) road in order to cut down on construction cost and minimize the shutdown time for maintenance. A segment of the road was located between the existing railroad tracks and a river. Due to lack of adequate clearance, a 300 ft.-long bulkhead (sheet piling with wale's, bracing, ties and backfill) was required to stabilize the river side slope. The original design also encompassed road lighting and the necessary work for protecting the underground utilities.

BASIS OF ORIGINAL CONCEPT

The owner should be credited for investigating two alternatives before starting the detailed engineering phase. The owner also considered the merits and shortfalls of each option. Rubber-tired vehicles traveling on a road was the selected option, based on the following reasons:

1. The existing main tracks "Conrail" are continuously utilized (four times a day) for transporting other molten steel from another complex to the existing plant.

2. Transporting the molten steel from the existing plant furnace to the new caster requires a dedicated track. The owner's staff could not find a way to include a dedicated track, especially along the main plant track feeder from Conrail.
3. The railroad operation would require three locomotives (two operating, and one spare). Each locomotive would be operated by a two-person crew.
4. Three rubber-tired vehicles would also required; but each would be operated by only one driver.
5. All existing railroad switches (of the existing plant) are being manually operated.
6. Expected average speed - when ladles are full - is 5 mph by locomotives versus 10 mph by rubber-tired vehicles. Similarly , the anticipated average speeds - when ladles are empty - are 10 mph by rail versus 25 mph by road.
7. Transportation time for each ladle was found (by the owner's engineers) to be approximately 10 minutes longer for one way by rail than that by road (26 minutes vs. 16 minutes). This would translate to an additional reheating cost during the operation.
8. Rubber-tired carriers would allow more flexibility in moving, and would allow for better maintenance of the operation schedule than that by rail.
9. The cost to construct the haul road was expected to be more expensive (about $1,500,000) than the track. However, savings of additional reheating cost of the molten steel ($500,000 per year) would pay off the extra construction cost in only 3 years of operation.
10. In case of spill-off accident, it would be easier to deal with the road than with the track.

Based on the above reasons, the subject seemed to be adequately investigated. As a result, any further study such as Value Engineering would have been considered waste of effort, time, and money.

VE STUDY APPROACH

The VE study started with gathering information. A meeting was held between the VE Team and the owner's engineering and operation representatives. The owner's manager of engineering provided a detailed review of the previously performed study. He was successful in persuading the attendees that, practical options were considered, economical analysis was performed, and life cycle cost was conducted. Though, he kept the door open for further investigation and/or new ideas, most of the attendees felt that the proper decision was to end the VE study and to concur with the presented conclusion.

The VE Specialist also felt that the owner's findings were correct if the basic assumptions were proven valid. Accordingly, the continuation of the VE study depended on verifying or defying the validity of the basic data and the considered assumptions.

INVESTIGATED ISSUES

The function of the haul road was described as a mean or a medium to transport molten steel from the existing furnace to the new caster. The only practical alternative was a railroad track. The major issues were mainly confined to: economical consideration, safety of operation, and the interference with the existing plant complex during the construction and the operation of the new caster. The contributing factors to these issues were defined as follows:

1. Construction cost.
2. Operation costs.
3. Travel time and its effect on the reheating cost.
4. Possibility of a dedicated track for the new operation.
5. Probability of spill-off accidents.
6. Coping with such accidents and their repercussions.
7. Interface of the new transportation pattern with the operation of the existing facilities.
8. Influence of the meteorological conditions on the safety of the transportation operation.
9. Maintainability of track versus road, and rubber-tired vehicles versus locomotives.
10. Availability of space for different layouts.
11. Method of loading and unloading the transported ladles.
12. Proper type of switching; size of operating crews, number of locomotives; etc. in case the track concept is selected.

NEW FINDINGS

The VE Team initiated an independent investigation, which was conducted based on actual measurements at similar operating plants. The collected data was in depth, accurate, and consistent. This investigation led to new findings, which can be summarized as follows:

1. Layout for a dedicated track can be attained.
2. Travel by track is faster (less time) than by road.
3. Utilizing radio control and automated switches can reduce the size of the operating crews, from a two-person/locomotive to one operator only.
4. Transporting molten steel is less accident-prone by track than by aggregate road, especially under unfavorable meteorological conditions.
5. Using a shielding plate (under the ladles), shaped as a saddle, can divert the spill-off to protect the rails.

RECOMMENDED ALTERNATIVE

The VE study recommended the utilization of the railroad track concept over the haul road. This recommendation was based on evaluating different options versus technical and economical issues. The recommended concept (track) satisfied all the owner's needs and the operation requirements, such as:

1. Minimum life cycle cost, i.e., less construction cost and less operation costs.
2. Less travel time, i.e., less reheating cost for molten steel.
3. Safer operation (lower probability for spill-off).
4. If spell-off occurred, the damage, if any, would be manageable.
5. The new track would be completely dedicated and operated independently from the existing "Conrail" track.
6. Less interference, if any, with the existing roads and tracks.

CONCLUSIONS

1. At the time of starting the VE workshop, it seemed that all technical and economical issues were addressed, and the VE study was a needless exercise. However, believing in VE techniques and adopting its methodology (systematic job plan) had paid off for the owner and the contractor.

2. This study confirmed the writer's belief that VE studies should not be bound to an artificial span of time such as one week or a 40-hour workshop.

3. Because of objectivity, clarity, accuracy, consistency, and the support of actual data, the client (owner) was willing to change his previous position and to accept the VE recommendations.

4. This study is another proof that VE can deliver the promise of more economical life cycle costs, less construction costs, and safer operation.