APPLICATION OF VALUE ENGINEERING TECHNIQUES

TO

PORTABLE BUNK HOUSES OF ONGC

A THESIS
SUBMITTED IN PARTIAL FULFILMENT FOR THE
AWARD OF THE DEGREE OF
MASTER OF TECHNOLOGY
IN
INDUSTRIAL ENGINEERING

By
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DEPARTMENT OF MECHANICAL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY, DELHI
MARCH 1986
CERTIFICATE

This is to certify that the thesis entitled "APPLICATION OF VALUE ENGINEERING TECHNIQUES TO PORTABLE BUNK HOUSES OF ONGC" which is being submitted by Major L.M. Gupta for the award of Degree of MASTER OF TECHNOLOGY in INDUSTRIAL ENGINEERING to the Department of Mechanical Engineering, Indian Institute of Technology, Delhi is a record of bonafide work carried out by him under my guidance and supervision. The results and conclusions obtained in this thesis have not been submitted earlier to any other University or Institute for the award of any degree or diploma.

Dated:  

(A.D. GUPTA)  
Assistant Professor  
Department of Mechanical Engineering  
Indian Institute of Technology, Delhi
ACKNOWLEDGEMENT

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Lastly I must convey my gratitude to my wife Usha and daughters Yogita and Sweta who inspired me to undergo M.Tech. studies and patiently acting as a spring board for numerous ideas emanated during the Value Engg. exercise.

(Maj. L.M. GUPTA)
SYNOPSIS

Exploring oil is a serious, risky and tricky business. Oil companies take chance by drilling oil wells at potential oil reservoires. If the oil is not found, all the efforts go waste. Oil wells are required to be drilled in remote areas where no facilities for housing the workforce exist. Generally 100-150 personnel are to be accommodated at one drill site. The options to house this workforce are:

(a) Build permanent houses: A costly, time consuming proposition unless oil is found.
(b) Build semi-permanent / temporary sheds: cheaper but uncomfortable due to hostile climatic conditions.
(c) Use portable/mobile bunk houses: costly but very comfortable and can be quickly deployed at new drill sites.

All over the world, oil companies are using bunk houses for housing the workforce at drill sites. In India, use of bunk houses by ONGC is a recent trend. Earlier workforce used to be accommodated in temporary sheds or used to commute daily from the nearest township. Some imported bunk houses were also in use. Due to expansion of ONGC, oil wells are being drilled at number of places. Since the working conditions are tough at drill rigs, ONGC procured approx 130 bunk houses for two drill sites.
located in western Gujrat, manufactured by M/s Bharat Earth Movers Ltd., Bangalore (Rail Coach Division). These are portable bunk houses (Fig.-1) of size 6.6M x 3M x 3M and in use since 1983-84. Due to odd dimensions, difficulty is being faced in transporting these bunk houses by road. In view of this, ONGC decided to go in for bunk houses based on ISO container design (Fig.-2) which has standard dimensions (6.6M x 2.5 M x 2.5 M) hence easy to transport and is much more stronger than a rail coach bunk house. ONGC requires approx. 200 portable bunk houses in next two years in addition to existing 130 approx. The draft specifications for portable bunk houses based on ISO container design have been formulated and these are going to be manufactured by M/s Balmer and Lawrie, Cochin. The weight of one bunk house is approx 4-4.5 tonnes and cost is approx Rs. 2,70,000.00 (For a 4-berth bunk house which is required in maximum numbers).

In addition, ONGC has also ordered Qty. 150 trailer mounted mobile bunk houses for deserts to be manufactured by M/s BEML, Bangalore. The overall specifications for all these bunk houses are almost same. The bunk houses have following categories based on their usage :-

(a) Two-berth
(b) Four-berth
(c) Main kitchen
(d) Service kitchen
(d) Dining hall
(f) Recreation hall
(g) Office cum dispensary
(h) chemical and Geological labs
(i) Toilet
(j) Bath etc.
Since the new specifications are still under finalization and users have some experience of the bunk house concept, bunk house design offers an excellent project for value engineering and value improvement. It is a very-very costly product when compared with the permanent house (The cost/sq.meter of bunk house is Rs.20,000.00 while a permanent house costs approx. Rs.2500.00 per sq.meter only). Since manufacturing of a bunk house does not require any special plant and equipment except fabrication facilities, the design changes can be easily incorporated at negligible cost. More over, other agencies like Oil India Ltd., Gas Authorities of India Ltd. have also placed orders for bunk houses, a recurring demand is envisaged for future.

This project of value engineering of bunk houses has been offered by western region head office of ONGC, Baroda, through Head, Training and Placement, IIT, Delhi.

Value engineering can be applied very effectively on such projects as these bunk houses have been designed in a hurry to meet the urgent requirement of housing workforce at various drill sites and a costly item.

This thesis is regarding the value engineering of the above bunk houses. In all types of portable bunk houses, the shell is a common item. The bunk house consists of the following main assemblies/fittings:-
(a) floor including underframe and skid,
(b) superstructure including sides, roof, doors, windows, insulation, panelling, fans and air conditioners,
(c) fixtures and furnishing which are different for different types of bunk houses depending on the usage.

The shell consists of floor and superstructure. This, being the common item, has been selected for detailed value engineering. In addition, alternative proposals for kitchen, foundation system for portable bunk house and trailer of mobile bunk house have also been analysed and are given below:

(a) Main and Service kitchen can be housed in temporary sheds instead of housing in bunk houses to have more working space and avoid fire hazards.

(b) Stone/brick masonry wall and foundation for placing portable bunk house can be dispensed with and steel pipe supports can be used which will avoid reconstruction of foundation and walls every time a bunk house is moved to new drill site.

(c) Trailer of Mobile bunk house for deserts can be dispensed with and portable bunk houses should be used to provide flexibility in deployment and
and reduce cost. A 5 tonnes crane can be positioned at each bunk house colony for lifting and placing the bunk house on a truck.

The cost of a portable bunk house can be distributed as:-

(1) Floor including underframe and skid - Rs.20,000.00 approx.
(2) Superstructure - Rs.90,000.00 approx.
(3) Fixtures and fittings - Rs.50,000.00 onwards depending on the type of bunk house

Similarly, the cost of a mobile bunk house can be distributed as:

(a) Trailer - Rs.65,000.00 approx.
(b) Superstructure - Rs.90,000.00 approx.
(c) Fixtures and fittings - Rs.50,000.00 onwards

By following the VE Job Plan systematically as described by Mudge (1) along with life cycle costing system for portable bunk house and formulating alternative proposals for other systems, the following saving potential has been identified:-
<table>
<thead>
<tr>
<th>Item</th>
<th>Saving potential per bunk house</th>
<th>no. of bunk houses affected</th>
<th>Total saving potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Portable bunk houses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Flooring System</td>
<td>Rs. 11,470.00</td>
<td>200</td>
<td>Rs. 22,94,000.00</td>
</tr>
<tr>
<td>(b) Panelling (side &amp; roof)</td>
<td>Rs. 4,625.00</td>
<td>350</td>
<td>Rs. 16,18,750.00</td>
</tr>
<tr>
<td>(c) Air Conditioning</td>
<td>Rs. 21,600.00</td>
<td>320</td>
<td>Rs. 69,12,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Rs. 37,695.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Foundation system</td>
<td>Rs. 12,825.00</td>
<td>340</td>
<td>Rs. 43,60,500.00</td>
</tr>
<tr>
<td>(e) Main and service Kitchen</td>
<td>Rs. 2,09,000.00</td>
<td>3 sets</td>
<td>Rs. 6,27,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Trailer - Mobile bunk house</td>
<td>Rs. 57,000.00</td>
<td>150</td>
<td>Rs. 85,50,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Rs. 2,43,62,250.00</td>
<td></td>
<td></td>
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***
AN ISO CONTAINER

FIG. 2
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