APPENDIX – B

CHECK LIST FOR VALUE ENGINEERING

The check list given below is a practical approach to Value Engineering and is based on the check list suggested by Gomes (1988). Its purpose is to stimulate thinking along Value Engineering lines in various areas such as Design, Production, Purchase, Organization, methods, etc.

A-1: Check list pertaining to raw material used

- Can a slightly different (but cheaper) raw material be substituted or can the same material be ordered in a form that would be more advantageous?

(e.g. use EN 9 in place of C 45 steel)

a. Shape (e.g. using hexagonal bar instead of round bar stock for manufacturing hexagonal head bolts.)

b. Size (e.g. buying material sizes giving minimum scrap.)

c. Material (e.g. (1) fuel tank cover of diesel engine changed from brass to plastic, to reduce cost. (2) Material of brass/steel gears changes to nylon for quieter performance, reduced cost and weight in portable machines.

d. Amount of processing done by supplier (e.g. procure finish machined components rather than rough machined ones to reduce processing, inspection costs and lead time.)

e. Colour (e.g. procure all sub-assemblies like gear boxes in the standard colour to avoid re-painting.)

f. Finish (e.g. procure bright bar instead of black bar to reduce processing cost and manufacturing lead time.)

A-2: Checklist pertaining to Product design

- Can the product be made, sold or sent out in a more advantageous form?

Can we:-

(a) Modify design

(e.g. brass fly bolts (non-standard) replace by steel fly nuts (standard) and M.S. nuts (non-standard) by hexagonal head bolts (standard) to reduce component cost.)
(b) Change finish?
(e.g. change over to matt/hammer tone paint finish to conceal minor defects and increase aesthetic value.)
(c) Change weight?
(e.g. 1 –by using box sections in fabricated components like machine bases to give lighter components for the same strength.
   e.g. 2 -by using plastic components instead of metallic ones to get lower weight to power ratio in automobiles and better product appeal.)
(d) Change tolerance / surface finish?
(e.g. close tolerances, which appear non-functional or surface finish requirements which are too stringent.)
(c) Reduce component size
   (Check if component is oversize by calculation, comparison, physical test, competitors’ component.)

- Are we surveying each of our parts or product often enough, keeping in mind questions similar to those, which follow?
  (a) What is the exact function of the part under consideration? Is this function necessary?
  (b) Can we eliminate the part or combine it with other parts?
     (e.g. A steel border fitted to the body of a machine and meant to seal off dirt and oil entering through panel door and body was eliminated and a rubber gasket fitted to the panel door itself with substantial savings.)
  (c) Could standard parts be substituted or could the component be fabricated from standard sections?
     (e.g. non-standard brass latches used in machine doors for opening / closing can be replaced by a standard latching arrangement in steel / aluminum.)
  (d) Does design permit least costly processing and assembly?
     (e.g. 1- in one machine 2 Nos. grilled covers located nearby and requiring totally 8 socket head screws were replaced by a single grilled cover (requiring only 4 screws) resulting in reduced assembly time and variety of components.
     e.g. 2- belt guard made from sheet metal instead of a casting.)
(e) Do we have items purchased as standard parts but modified often at a cost exceeding the original purchase price, which could by revaluation and slight changes in other parts be used as purchased?

(f) Have we recently checked the accessory items or features to see if they are functional as used today?

(The elimination of unnecessary outdated product features will reduce product cost.)

(g) Could we by mounting some part from the opposite side or end on a convenient support greatly simplify and lower the cost of a third part?

(h) Will a slight modification of some of our parts allow better resting and saving of raw material?

(i) Does every bend in our material perform a function?

(Particularly important in case of hydraulic piping)

(j) Does every hole in a component perform a function?

Can we reduce number of holes and standardizes hold diameters and tap sizes?

(e.g. By value engineering, lifting holes in a components were reduced from 4 to 2)

(k) Is all the machining prescribed in the drawing necessary?

Can we eliminate / reduce the area of machining required of some surfaces?

(e.g. machining of bottom pads in a machine base were found unnecessary and hence eliminated.)

(l) Can we modify to reduce space occupied by a machine by increasing its height?

- Do we read the proper magazines, guides, lists etc. to be reasonably well informed?

- Have we established a definite routine, which assures that we take time to study new products and new price relationships?

A-3: Check list pertaining to Processes

- Is any operation unnecessary?

  (a) What does it accomplish?

  (b) Why is it done?

  (c) What could happen if it were not done?
(e.g. if punching of hole numbers on Valve mounting blocks is avoided and numbered adhesive tapes used instead, grinding time can be reduced considerably.)

(d) Can the purpose of the operation be obtained in another way?
(e.g. plane milling instead of planning.)

(e) When is it done? When else can it be done?
(e.g. in a large machine shop, sward from each machine was collected in a trolley and taken out of the shop for disposal. A large chip dump located centrally in a shop itself saved considerable machine down time. The chip dump is emptied out by forklift truck.)

- Can we:-

(a) Eliminate / combine any operation?
(e.g. in machining the inside of a long L-shaped guide rails both planning and face milling operations were used earlier. The planning operation was eliminated and a shell end milling cutter was used to machine both mutually perpendicular surfaces simultaneously, with good surface finish and reduced processing time.)

(b) Arrange operations in best sequence and reduce handling.

(c) Advantageously break up any job into two or more separate operations.
(e.g. a T-shaped bracket earlier made from a solid block, is now make as a fabricated item to reduce material wastage and processing time.)

- Can inspection be eliminated, combined, shortened or made easier?
(e.g. by procuring finished components and even sub-assemblies.)

- Can the productivity & quality be improved by using new-processes?
(e.g. MIG welding instead of conventional arc welding.)

- Will a change in standards and inspection requirements reduce rejection and improve quality without increasing costs?

- Is the material used to the best possible advantage during cutting, processing?
(e.g. many end pieces generated during flame cutting of M.S. plates are large enough to be used for smaller items.)
A-4: Check list pertaining to Tools, workplaces and equipments

- Can any new tool or equipment or a change in the workplace layout / shop layout make any job in the sequence easier?
  (e.g. use of power tools for deburring, tapping and scraping to increase productivity.)
- Can any tool or equipment be eliminated advantageously?
  (e.g. use NC centering drill on CNC machines to combine centering and counter-sinking operations and eliminate counter-sink cutter.)
- Can any two or more be combined?
  (e.g. combined end stopper and centering unit in Capstan Lathe leaves one turret station free for other tools.)
  - Can a sub-operation be made easier by:-
    (a) Better tools
    (e.g. using a counter-sink cutter mounted on a hand drill instead of a scraper for deburring holes in assembly.)
    (b) By changing leverages or positions of controls.
    (c) By reducing material handling.
    (e.g. using a gravity delivery chute to transfer components from machine to pallet.)
    (d) Better workplace heights
    (e.g. by using bar knobs in place of hexagonal nuts for clamping the job.)
- Can the cycle be arranged so that more of the handwork can be done during running time?
  (a) By automatic feed
  (e.g. gauging previous component during machining of next.)
  (b) By change of man and machine phase relationship
  (e.g. using a multi-station fixture to permit loading / unloading during machining.)
  (c) By automatic power cut off at completion of cut or in case of tool or power failure.
- Is the equipment for handling and moving material appropriate and are the containers designed to permit handling of components with ease and without damage?
  (e.g. 1- Protecting small wound motor stators or precision components from damage by suitably designed tray or pallets lined with felt.)
A-5: Checklist pertaining to Purchases and Inventory control

- How nearly do we buy function?
  i.e. how nearly are we buying something to fasten (instead of an Allen screw), something to write (instead of a pencil).
  - Do we buy items/services whose functions we do not understand?
  - Do we when buying such functional items/services often feel that our company is not receiving a rupee worth of function for every rupee spent?
    (a) If so, why do we buy them?
    (b) Who specifies them?
  - Do we satisfy ourselves that the company receives the best value for money by ensuring that each item bought is the right item, of the right quality and purchased from the right supplier?
  - Do we hold our Company’s investments in materials, parts and services to a minimum?
    (a) Do we schedule materials and services blindly at the dates requested?
    (b) Do we know enough about their use so that we can hold our company’s inventories to a minimum?
    (c) Do we take the responsibility for scheduling materials, suppliers and services to come into our inventories at the time they are needed?
    (d) Are we constantly in touch with suppliers and know best the planning and delivery cycles which they require so that we can determine the proper amount of time necessary for the supplier to purchase materials, make the item, and deliver it to us on schedule?
  - Does ordering quantities are known to have a large effect upon purchase cost. How nearly do we approach optimum order size, considering purchase price, cost of carrying inventory and possible obsolescence?
  - Have we given our suppliers every chance to operate at the lower costs by scheduling our requirements on them far enough in advance?
  - Are we accepting costs on any parts that are higher than their value?
  - Do we see that our company receives full value for salvage?
(a) Do we screen it for material? E.g. end pieces of channels plates, angles, flats and bar stock can be used for repair / manufacture of material handling and storage equipment, manufacture of bases etc, manufacturing small components, fabricated components, etc.
(b) Do we negotiate for best returns from it?
(c) Do we clear it out promptly so that it does not become mixed, contaminated, spoilt or lost?
(e.g. proper segregation and prompt disposal of used cutting / hydraulic oils for reclamation.)
(d) Can the scrap generated by our company become the raw material for another e.g. use of alloy steel and pieces in Tool rooms.
(e) Can we recycle waste material e.g. reclamation of hydraulic / cutting oils by mechanical / chemical process?

A-6: Checklist pertaining to Vendor development

   • How do we select suppliers?

(a) Do they seek us or do we seek them? Do they sell us their products or do we sell them our needs?
(b) Do we have the manufacturing capability and all the facilities to provide dependably the items we need for him?
(c) Should we modify our system somewhat by aggressively searching out the proper suppliers?
   • How effectively do we transmit to the suppliers the functional requirements of special parts and special products and solicit and get their suggestions for simpler, lower cost products to perform the same function?
   • What suppliers have we selected who are leaders in ingenuity and ability along the lines of our needs?
   • How effectively do we use all the available industry guide, books, magazines, etc?
   • What importance are we placing on reliability?

(a) Are we in little difficulty or in constant difficulty because the suppliers we use do not keep their commitments?
(b) Would it benefit our company in the long run if we adopted a stronger policy and in general stopped dealing with companies who frequently default on commitments?

(c) What is our policy with suppliers on faulty quality?

(d) Are all of the actions we take regarding the expenses that come with faulty quality, extra inspection, extra handling, extra transportation, extra delays in the factory, etc. evaluated and acted upon in a manner that will get the company the best value?

- Can we secure alternate quotations from our vendors covering adjacent parts, which we buy from them both in the unassembled and the assembled form?

(a) Have we considered other similar parts, which they might provide with the assembly as one unit and give them an opportunity to provide a proposal on it?

- Are we making parts on machines because we have them, although they could be purchased from suppliers at lower cost?
- Can we locate and develop a source so as to find import substitute?

A-7: Checklist pertaining to Packaging

- Can we change mode of packaging?
  (e.g. pack capsules in blister packs instead of bottles to reduce packaging cost and breakages.)

- Can we reduce volume / size of package?
  (e.g. by changing the method of strapping a machine in a wooden case, the volume of the case was reduced, resulting in substantial savings of this exported product.)

- Can amount of packaging material used be reduced?
  (e.g. reduction in the quantity of felt required to pack a machine.)

- Can we standardize and reduce the variety of packages?
  (e.g. variety reduction and standardization in design of wooded packing cases, can reduce packaging and inventory costs.)

- Can we improve packing methods?
  (e.g. fastening a machine to a packing case by a specially designed box spanner, instead of open ended spanner, to save time and energy.)

- Can packing material / container be reused?
(e.g. 1- wooden cases in which material is received, if stored systematically can be used to pack spared parts for dispatch.

e.g. 2- empty oil drums can be cleaned reused for filling recycled / reclaimed oil.)

7.7 Can we pack more items in the same container or with slight modifications?
(e.g. a slight modification in the design of a packing case, permitted two times to be dispatched instead of one.)

A-8: Checklist pertaining to O & M

- Why is the form necessary?
- Who uses the form?
- What is its cost?
- How can the purpose be accomplished without this form?
- Will another form serve that purpose?
- Why is each copy of the form necessary?
- Who receives each copy?
- What does the recipient do with each copy?
- Can one form be made to serve the purpose of several?
  (e.g. combine delivery challan, goods received note and inspection report in one form.)
- Why is each item on the form necessary?
- Can we reduce the size of the form and use a standard size of paper?

A-9: Tests for Value

- Can we do without it?
- Does it need all of its features?
- Does it cost more than it’s worth?
- Is there something better that can do the job?
- Can it be made by a less costly method?
- Can a standard item be used?
- Does it cost more than the total of reasonable costs for material, labor, burden and profit?
- Can a less costly tooling method be used, considering the quantities involved?
- Can another dependable supplier provide it for less?
- Is anyone buying it for less?