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# Quality circle approach to vertical belt elevator in agro industries

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***Abstract*— In this modern competitive industrial world one can get a step ahead of his competitor by selection of proper material handling equipment. Material handling process is overhead for the production but it is heart of any process plant. Still people prefer most advanced material handling equipment even though they are costly. But cost can be justified after prolonged usage of that equipment. Bucket elevator has evolved as advanced material handling equipment in mechanized bulk material handling industry. The effective use of different type of bucket elevators are completely depends on its design and type of bulk material. In this report different types of bucket elevator are discussed along their different parts and the design of centrifugal discharge bucket elevator with simultaneous buckets for lifting wheat at a certain height is reported for a particular output rate**.

***Keywords*— Quality Circle, Vertical belt Elevator**.

## I. INTRODUCTION

A bucket elevator, also called a grain leg, is a mechanism for hauling flow-able bulk materials (most often grain or fertilizer) vertically. Typical elevators consist of a series of buckets mounted on chains or conveyor belts & enclosed in steel casings. Basically, it consists of:

1. Buckets to contain the material;
2. A belt to carry the buckets and transmit the pull;
3. Means to drive the belt;
4. Accessories for:
   - Loading the buckets or picking up the material,
   - For receiving the discharged material,
   - For maintaining the belt tension and

For enclosing and protecting the elevator

**WORKING PRINCIPLE**

Buckets are mounted at intervals on a belt or chain. The elevator will handle any free flowing fine or small lump materials. The centrifugal style elevator operates at high speeds to throw the material by centrifugal action out of the buckets into the discharge spout as the buckets pass over the head pulley/sprocket. The buckets are spaced in wider intervals to prevent discharge interference from the proceeding bucket and to assure maximum fill of the buckets at the boot end while moving at higher speed..

A bucket elevator consists of an endless belt that passes around drive and tension pulleys (or sprockets) and on which buckets are mounted. The supporting and enclosing structure of the elevator may be a welded steel casing with a loading spout and a discharge spout. The elevator's drive comprises an electric motor, a reducing gear, clutches, and a backstop that prevents reversal of the belt.

Quality Circles first emerged in Japan in the 1960's and were originally introduced in the journal, Gemba-to-QC, first issued in April 1962. Kaoru Ishikawa has been credited with creating Quality Circles as a method of improving quality. The movement in Japan was coordinated by the Japanese Union of Scientists and Engineers (JUSE). According to QC Headquarters, Japan, the basic principles behind Quality Circle activities, carried out as part of company-wide quality control activities

## II. QUALITY CIRCLE APPROACH TO PROBLEM

1. Problem Identification: Define and agree the problem to be resolved at this stage.
2. Problem Selection: Agree as a team on the problem to be addressed initially.
3. Problem Analysis: Gather data associated with the problem.
4. Come up with potential Solutions
5. Agree best solution
6. Create potential Implementation plan,
7. Present findings to Management and
8. Get agreement on Implementation Implement solutions

## III. PRESENT WORK

In present work quality circle plays an important role in making bucket elevator a very successful machine in agriculture industries. Quality circle approach helps the agro industry in maintaining a quality of the product without increasing the cost of the product which is a major factor due to competition between various agro industries. Quality circle with its various techniques helps in identifying various problems and improvements and not only identifying but also provides the solutions to that problems and provides the means to implement that solution so that machine will improve. Quality circle is never ending process. In agro industries quality circle works on the theory of still room for improvement. All the members are committed to their work so that with the help of their ideas machine can be imp Vertical belt elevator is a machine which is use to lift the material from floor level to a height upto fifty metres. This type of elevators are used in mostly food industries or grain industries. These elevators are placed in front of every food grading machines so that instead of feeding material directly to grading machines which are of certain height from the floor level. This machine helps in reducing man power and their efforts to lift the material up to the height of the machine. But there were certain demerits in its working. but after applying quality circle and their tools we achieve success in making a bucket elevator a very successful machine .there were so many demerits earlier but after

 

applying quality circle approach we find out solutions of various problems which need to be rectified so that this machine has develop in good error free machine. Quality circle approach not only helps in finding solutions to various problems but also provides the means to implement them

## IV. PROBLEMS IDENTIFICATION

1. Causes related to breaking of material
(a) Poor pulley design
(b) Over feeding
2. Causes related to slippage of belt
3. Causes related to burning of motor
(a) Over load
(b) Resistance in movement of belt
4. Causes related to reverse movement of belt
- Power failure
- Excessive material in bucket
5. Causes related to breaking of off tracking of belt

## V. RECOMMENDATIONS & IMPLEMENTATION

The main objective of quality circle is not only to find the solutions for the various problems but also to implement them. After implementing the changes the comparison between the previous and present working of V.B.E takes place.

1. Use of rubberized pulley in head section of V.B.E
2. Use of conical pulley with wings in boot section of V.B.E
3. Use of anti reverse mechanism.
4. Use of rpm sensor on shaft of boot section.
5. Use of torque limiter sprocket.

## VI. RESULTS AND DISCUSSIONS

**(a) Minimizes the grain damage in boot section**

Before implementation: Grain damage in boot section is 25-30%

After implementation: grain damage reduces to 5-10%

**(b) Reduces the off tracking problem of belt**

Before implementation: Off tracking of belt takes place within 1-2 week of continous operation

After implementation: Off tracking of belt rarely takes place, it happens once in every six months

**(c) Improved output and easily identification of slippage of belt**

Before implementation: The output capacity of V.B.E was 75-80%

After implementation: The output capacity of V.B.E is 85-90%

**(d) Eliminate burning of motor due to overload**

Before implementation: Burning of motor due to overload takes place in 15-20% cases

After implementation: Burning of motor due to overload is eliminated completely

**(e) Eliminate reverse movement of belt due to power failure**

Before implementation: Reverse movement of belt takes place every time due to power failure

After implementation: Reverse movement of belt due to power failure is completely eliminated

The vertical belt elevator used in agro industries is of great importance. But unfortunately due to some design and manufacturing faults its working was not up to the mark. After making necessary changes in V.B.E it works exceptionally well. These changes not only helps in making V.B.E a error free machine but also improve its efficiency as well as effectiveness. This lead not only to the profit of manufacturing company, customers, but also solve the problem of safe material handling.

## VII. CONCLUSION

In this modern competitive industrial world one can get a step ahead of his competitor by selection of proper material handling equipment. Material handling process is overhead for the production but it is heart of any process plant. Still people prefer most advanced material handling equipment even though they are costly.

But Quality Circle approach helps in reducing the cost and enable the V.B.E to work properly throughout its working life. Bucket elevator has evolved as advanced material handling equipment in mechanized bulk material handling industry.

The present study shows:

(i) Quality circle approach in V.B.E ensures efficient and safe movement of materials to the desired place.

(ii) Quality circle approach in V.B.E helps in identifying, rectifying and implementing various mechanical problems in V.B.E.

(iii) Quality circle helps in improving manufacturing methods and able to minimize money wasted on unreliable manufacturing techniques.

(iv) Quality circle approach helps in improving output capacity as well as ensure safe proper working of V.B.E.

(v) Quality circle approach to V.B.E helps in lower the cost of material handling.

(vi) Quality circle approach helps in reducing the production time, man power and improve the overall quality of the V.B.E.

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