Minimising the breakdown in Belt Conveyor System of Coal Handling Plant

S.Ojha[1] B.K. Pal[2] B.B. Biswal[3]
[1]Assistant Professor, Department of Mechanical Engineering, Parala Maharaja Engineering College (Berhampur, India)
[2]Professor, Department of Mining Engineering, National Institute of Technology (Rourkela, India)
[3]Professor, Department of Industrial Design Engineering, National Institute of Technology (Rourkela, India)

Abstract

This research paper focuses the actual situation of coal handling plant for failure of belt structure and analyse the technical characteristics with probable reasons for prevention and elimination. So that it is very important to find out the root causes among the probable causes. At last after finding out the root causes, we proceed the solutions. In this paper analysis the cause of failures with root causes and their proper solutions for reduction of cost and availability of equipment.

Keywords- *Fishbone diagram, Pareto analysis, Cost feasibility*

INTRODUCTION

Structure or frame part is the root foundation while constructing and installing the equipment. It is not only used in belt conveyor system of coal handling plant for transporting the material from one location to another one but also used in general ways starting from construction of buildingto siding bridge of railway while crossing a river.

Belt Structure

Belt structure is the major component in belt conveyor system that supports and maintains the alignments of the idlers and pulleys and also support the driving machinery. While installing the frame of the belt conveyor system which is at first start with the head frame, followed by all middle frames in order, last is the tail frame. Before the frame is set up, a centre line is dragged along the whole conveyor, as keeping the conveyor's centre line Collinear is the vital condition of ensuring normal running of the belt. Hence, all sections of the frame must be aligned when they are installed. Depending on the situation the structure can be mounted on floor or on skid. The main job of the support is to let the belt run without getting skewed. Depending on situations the support can be made moving type. In such cases idler a wheel mounted platform keeps the necessary provision to support the idlers on which the conveyor runs. It generally get damaged due to improper shading area which is affected by corrosion, spillage of coal and also off-centring of pulley or belt.

Identification of Causes

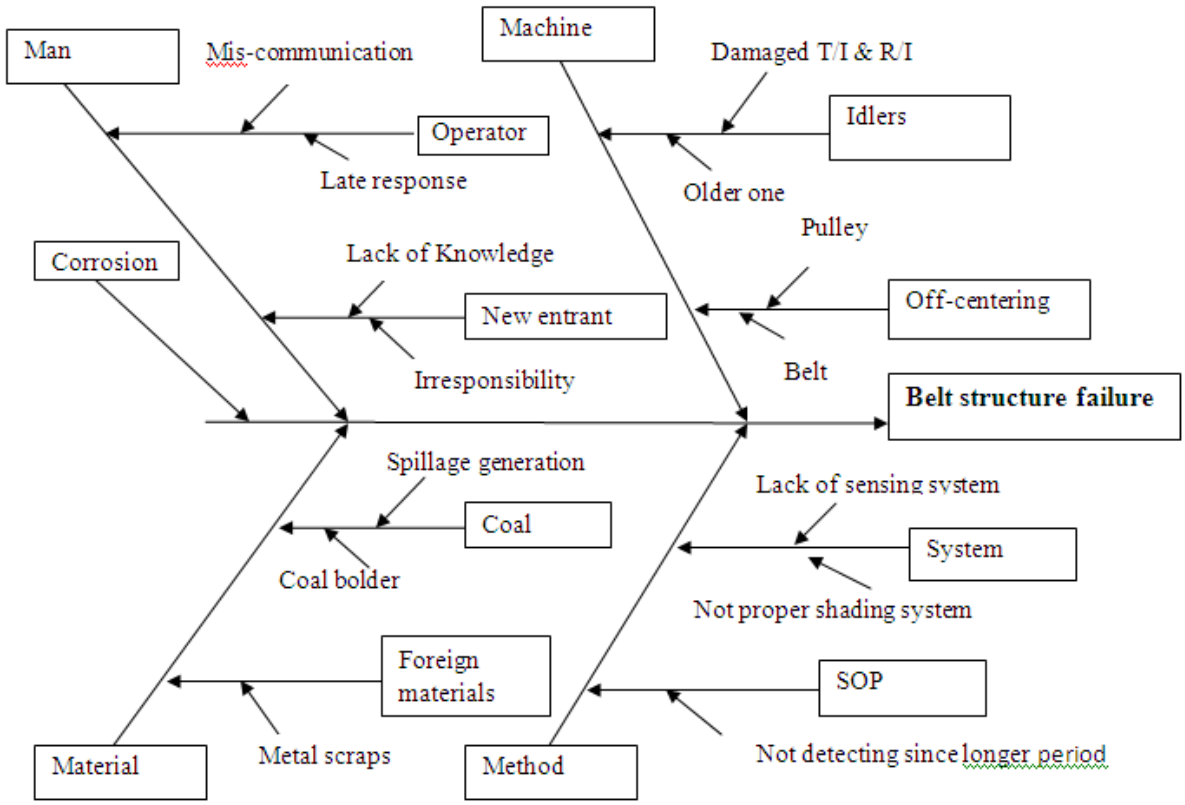
In order to identify the causes of 4M (man, machine, method & material) are considered as four main causes and a fish bone diagram is prepared after visiting the sites, depth of searching and go through thinking, all possible causes, sub causes and sub-sub causes are collected which is shown below.

Brief analysis of cause and effect diagram:-

Man:

Specific Operator: Due to improper housekeeping of spillage coal led to belt structure damaged which affects unloading in wagon tipplers causing production loss and demurrage.

New Entrants: Inadequate training, less knowledge and lower skill of the new entrants contribute to this problem.



Material:

Materials: At the time of installing vendors are provided poor quality of material which causing belt structure failure.

Coal: while handling of coal some metal scraps and boulders are came which give heavy impact load on the belt and sometimes cause damage.

Machine:

Idlers: Due to misalignment of older idlers which are mounted in belt structure causing failure.

Off Centring: Due to improper maintenance like greasing, tightened and tensioning belt or pulleys are deviate its original position which is actually fitted with structural frame causing structure failure.

Spillage of Coal: During handling of coal through belt conveyor system, spillage of coal are generated and it stored in structural frame causing belt structure damaged.

Method: Improper cleaning, inspection by people and not in the system for shading purpose and protection unit for spillage of coal and electrical sensors for signalling before failure which causing belt structure failure.

Table: 02 – Prioritization of Root causes of Belt Structure Problem

SL. No	CAUSES	SUB CAUSES	ROOT CAUSES	CONTRIBUTION
1.	**MAN**			
		Operator		
1.1			Mis-communication	Low
1.2			Late response	Low
		New Entrant		
1.3			Lack of knowledge	Low
1.4			Irresponsibility	Low
2.	**MACHINE**			
		Off-centering		
2.1			Pulley	High
2.2			Belt	High
		Idler		
2.3			Damaged T/I & R/I	High
2.4			Older one	Medium

3.	**METHOD**			
		Sop		
3.1			Not-detecting science longer period	Low
3.2			Less experience	Medium
		System		
3.3			Not proper shading system	Medium
3.4			Lack of sensing system	High
4.	**MATERIAL**			
		Foreign Materials		
4.1			Metal scrap	High
4.2			Iron particle	Medium
		Coal		
4.3			Coal bolder	Medium
4.4			Spillage generation	High
5.	**MOTHER NATURE**			
		Corrosion		
5.1			Structural part	High

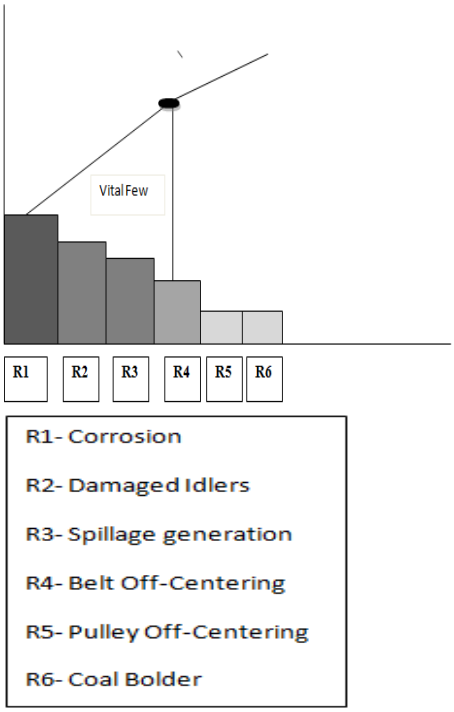
Data Analysis :(A Case Study)

Failure of Belt Structure (Quarterly Basis)

Root Causes	1st April-31 stJuly 2013	1st Aug- 30st Nov 2013	1st Dec-31st March2014	Total	%Contribution	%Cumulative
Damaged Idlers	2	1	1	4	23	23
Belt Off-centering	1	0	1	2	12	35
Pulley Off-centering	0	1	0	1	6	41
corrosion	3	2	1	6	35	76
Spillage Generation	1	1	1	3	18	94
Coal Bolder	0	1	0	1	6	100

Pareto Analysis:

For finding out dominant root causes



Developing Solution:

- Proper housekeeping and applying non-corrosion material over the structure like colour painting.
- Idlers should be check and replace in timely basis.
- Belt should be tensioning properly for avoiding belt off- centring.
- Providing shading provision over the structure and improve the life period**.**

Cost Estmation and Evaluation:

1. Demurrage calculation

Delay period of Belt structure broken = 11.15hr
Demurrage Charge = 11.15*8850 = 98677.5/-

2. Equipment Damaged

Channel Broken (150*75) – 20 Meter, i.e 20 Mtr each side of belt = 40*588 = 23520/-
T/I Stands – 21 Piecesi.e 21*1300 = 27300/-
T/I- 63 Piece i.e 63*1019.32 = 64217.16/-
R/I - 10 piecei.e 10*2384.25 = 23842.5/-
Clit- 20 piecei.e 20*200 = 4000/-

Total Cost = Channel cost + T/I Stands Cost + Idler Cost + Clit Cost

= 23520 + 27300 + 64217.16 + 23842.5 + 4000
= 142879.66/-

Total loss of company due to equipment breakdown = Damaged Cost + Demurrage
= 142879.66 + 98677.5
= 241557.16/-

If we will implemented colour painting in quarterly basis

1. Material Cost

Cost of Colour in 20 Mtr Channel = 400/-(4 Lit @ 100/Lit)
Cost of Colour in 21 Piece T/I stands = 500/-(5 Lit @ 100/Lit)

2. Labour Cost = 300*3 = 900 (300/Labour)

Total Expenditure = 900 + 900 = 1800/-
For yearly basis = 1800*4 = 7200/-
Benefit = 241557.16 –7200 = 234357.16/-

By the following above suggestion, we can improve the equipment availability and minimizing the demurrage charge and also reduce the repair cost.

CONCLUSION

The goal of every company to maximize the profit through improving the life of the conveying system, improving efficiency, minimizing of demurrage charges, minimizing the balance of flow line, improving the customers satisfaction, reducing the repair cost and mtbf.This paper emphasizes the root causes of failure and their solutions which is helpful for improvement of operator while doing their own job in site.

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