

Failure analysis of belt in conveyor system for coal handling in thermal power plant

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ABSTRACT

The study is made and compared with actual situation of the thermal power plant, for the failure in belt of conveyor due to the deviation under load from its axis. Analyze technical characteristics causing the deviation in the belt and the operating characteristics of relevant machinery causing deviation. Based on the research, failure in belt due to deviation during use, analysis the cause of failure, proposed some method to reduce it are summed up.

Keywords: conveyor belt, deviation, typical failure

1. INTRODUCTION

Belt conveyors are, in most cases, the most cost-effective solution for bulk material handling for shorter and medium distance. The belt is the key component of these conveyors because its cost is approx. 25 ~ 50% of the total cost. The major failure occurs in the belt are due to the deviation of it from its central axis. Little research is carried out in this direction is by Lihua Zhao, Yin Lin.

Lihua Zhao, Yin Lin worked for the typical failure analysis and processing of the belt conveyor[1], they both have also worked for the operation and maintenance of coal handling system in thermal power[2] plant. This paper is advancement in the same direction, taking the issue of conveyor belt deviation as compared with actual situation of the conveyor belt in thermal power project for coal handling.

2. COAL HANDLING SYSTEM

Coal handling is an important part of thermal power project and usually requires technique which can handle large quantity of coal. Coal in the thermal

power project is to be handled from the unloading site to the site where is to be stored and then to the place where it is to be burned. An effective handling system which can work coordinating with project is conveyor system and for a limited distance transfer, belt conveyor is best as it is the cheapest handling system which works with higher efficiency, low maintenance cost and can handle bulk quantity at a time.

3. CONVEYOR SYSTEM

Conveyor system are used to handle large quantity on a fixed path, it transfer quantity with higher efficiency and for the belt conveyor, the cost of belt is approx. 25 to 50 % that of total conveyor system, so proper attention is to be paid to it for its long life and to reduce the chances of failure. The belt is the member which carries the load and runs over the roller, it generally get damaged due to the deviation produced in the belt during loaded condition, these various conditions are discussed in this paper.

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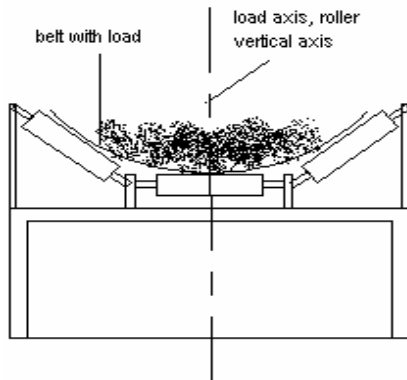


Fig. 1. Conveyor belt without deviation

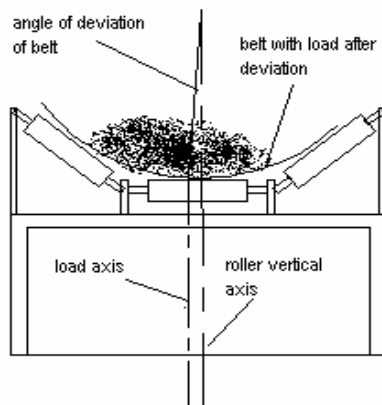


Fig. 2. Conveyor belt deviation under load

The belt deviation can be defined as the deviation of belt center line from the center of the conveyor system such deviation damages the edge of the belt and produces defect in belt which shortens the life of belt, so the work is to be done to reduce this kind of rack wear by the deviation.

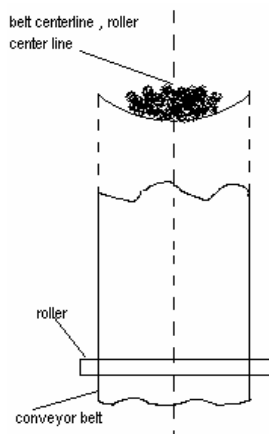


Fig. 3. Conveyor belt without deviation

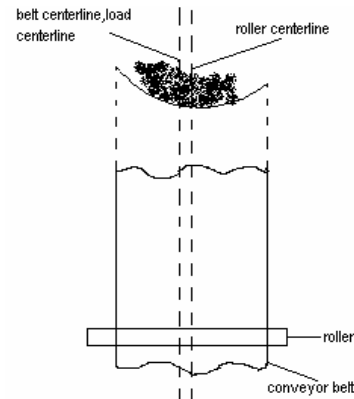


Fig. 4. Conveyor belt without deviation

Fig 1. Shows the actual running condition which a conveyor belt must follow for a stable run under load where as Fig 2. Shows the condition when the deviation is occurred during loaded run. Fig 3. Shows the position of the belt on the roller during motion, for no deviation the centerline of belt must run on the center line of the roller where as Fig 4. Shows the deviation of the centerline of the belt from the centerline of the roller, which causes the shift of the load from its central axis causing the failure in the belt.

The general causes of deviation are

1. *Manufacturing defect*

The defect produced in the belt during manufacturing are the unevenness in the edge of the belt i.e. somewhere they are thick and somewhere they are thin, these unevenness of edge produces a shock waves when the belt runs over the idler causes the deviation results into the damage of the belt edge. The other defect is in the length at the edge of the belt i.e. the belt edge is not proper in the length which is common defect with the belt results into the deviation.

2. *Installation defect*

During installation of new conveyor system there are various error which can cause the belt to deviate along its path, these error are:

2.1 Parallelism error of idlers i.e. the arrangement of idlers along the length is not proper, the idlers arranged are not parallel to each other may cause the deviation of belt.

- 2.2 Feeder or the hooper mouth is not arranged properly, the material discharged from the feeder must fall at the center of the belt, and if the arrangement is not proper then the material will not fall at the center and the load distribution on the belt will be uneven and will cause the deviation.
- 2.3 In the arrangement of incline- horizontal conveyor system, the change roller axis and conveyor centerline axis has bigger angle, makes the wrap angle much bigger hence causes the deviation in the belt.
- 2.4 In the arrangement of trough roller, if there is unevenness between the angles of the two side rollers along the horizontal axis of the middle one, may make the belt centerline shift little bit hence result into the deviation of the belt along the path.

3. Maintenance defect

There are many defects which are produced with low maintenance of conveyor which causes the deviation of belt and results into the major accidents these are:

- 3.1 Poor maintenance of the idlers can make them jam due to which the belt may slide and can deviate from its path.
- 3.2 The vibrating supporting frame may cause vibration in the loaded belt which produces unwanted forces as a result of these uneven forces the belt can deviate from its path.
- 3.3 When working with highly viscous material, these materials may get collected over the roller surface making its diameter uneven due to which the belt deviation may occur.
- 3.4 The impact idler used at the point of loading, if not arranged properly then they results into the deviation of belt
- 3.5 Improper leveling of idlers may result into deviation

4. Defects generated during run

When the belt is under running condition any external change in the conveyor system may cause the unwanted force to get generated and which result in the deviation of belt, some of these are discussed such as:

- 4.1 The take-up is not adjusted properly then the tension in the belt is not proper because of deformation produced in the belt due to self elongation can cause the deviation.
- 4.2 When the supporting roller rotation is not flexible then due to inflexibility in the rotation may cause the uneven stress to get generated in the belt resulting in the deviation.
- 4.3 The joint in the belt may produce the uneven stress and due to which the deviation may occur in the belt
- 4.4 The wear marks on the roller may increase the fictional force and due to which the belt centerline moves outward and deviation occurs.
- 4.5 The improper adjustment of roller bearing may result into the leveling difference in the sides of belt results into the deviation.

4. MEASURES TO PREVENT THE DEVIATIONS ARE

1. Manufacturing defects can be reduced by adopting improved design, improved method for manufacturing of belt, improved machinery which can produce belt with standard quality, these all can reduce the deviation due to manufacturing defects.
2. Installation defects can be reduced by adopting precision in installation of frame and supporting elements, proper installation of feeder, idlers and idler bearing can reduce the installation defect, self-aligning roller must be used by which the deviation may get reduced.

3. Maintenance is life long process and its quality determines the life of belt so the measures must be adopted to ensure that the condition of frame and supporting of belt remains same as that they are at the time of installation of system. Proper lubrication, proper cleaning and proper adjustment of idlers may results in longer life of belt and reduce the causes by which the deviation occurs.
4. Proper monitoring of condition of the belt is required during run time and if any error is located then it must be rectified at that time only which can reduce the chance of other bigger failure, loading of coal must be done through feeder with grid vibrator so that the high load does not get transferred directly to the belt at same point these all can reduce the chance of deviation of belt centerline from its axis.

5. CONCLUSION

This paper is the study of conveyor system in thermal power project in which the study is carried out on the failure of belt due to deviation and various causes by which it occurs, analysis different factors and methods which can reduce the deviation and can improve the life of the belt, reduce the rack wear of belt.

6. ACKNOWLEDGMENT

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REFERENCES

- [1] Lihua Zhao. Typical failure analysis and processing of belt conveyor [J].Hoisting and Conveying Machinery; 2003,NO 10.
- [2] Lihua Zhao, Yin Lin. Operation and Maintenance of Coal Handling System in Thermal Power Plant, [J].Colliery Machine; 2011,NO. 02.
- [3] Lihua Zhao. The adjustment method of conveyor belt deviation, [J]. Colliery Machine;2001,No.05.
- [4] Raghvendra Singh Gurjar. Failure analysis of belt conveyor system, [J]. IJESS Volume 2, Issue 10.2012