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Analysis for Controlling Belt Deviation in Conveyor System

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Abstract

In this paper an analysis of maintenance data of the two different structural components used for controlling belt deviation in conveyor system, working in coal handling plant of thermal power plant has been done. The new set-up of controlling belt deviation has been compared with the present set-up on the maintenance ground to find out the effectiveness of the new hydraulic control system. The new set-up consists of hydraulic control self aligning idlers with displacement sensor, is compared with the present set-up of mechanically controlled self aligning idler system.

Keywords- Belt, Conveyor system, Failure, Self-aligning-idler, Hydraulic control.

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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. As per the maintenance data of the coal handling system working in the thermal power plant, the root cause founded for all the failure in the belt is deviation of belt, so there is a need to develop an advance system for controlling it. Tracking or training is the procedure required to make the conveyor belt run true when empty or fully loaded. It is the process of adjusting idlers to correct any tendencies of the belt to run other then true.

[1]Lihua Zhao has worked for the failure analysis and processing of belt conveyor system, [2]Lihua Zhao has done the work on the operation and maintenance of conveyor system in thermal power plant, the main issues of the system maintenance and failure derived by the research of Lihua Zhao was that of belt deviation. [3]Lihua Zhao has worked for the adjustment method of conveyor belt deviation, adding to that this research has been made. [4]Zhang Jia-wei, Lou Pei-huang has provided the method for automatically detection of the belt deviation and controlling it hydraulically so that the adjustment of the belt can run on the true position.

The research department has installed hydraulic control system with displacement sensor in one of the conveyor system running parallel to the present system having self aligning idler installed with it for controlling belt deviation. The comparative maintenance data of both the system working in same condition proved that hydraulic control system is much more effective in controlling belt deviation and hence it must be used in other conveyor system for reducing failure due to deviation.

Present set-up

Present set up consists of self aligning idlers. The arrangement of self-aligning-idler is installed at the carrying side and return side at an interval of 15m on the carrying run and 30m at the return run.

Fig.1 shows the set of self aligning idler or the training idler that works for the controlling of belt deviation mechanically. It is mounted with the idlers on both the sides of the conveyor i.e. at the carrying side and at the return side also.It consists of an ordinary troughed three roller idler (1), mounted on swivel frame (2), which is free to swivel within a limit about a vertical pivot (3). When the belt shifts off the centre, the edge contracts on actuating roller (4) with a slight pressure, and makes the idler take a skewed position when a force acts which tends to steer the belt back to its central position. As the belt return to its central position, it automatically returns the idler to its initial position.

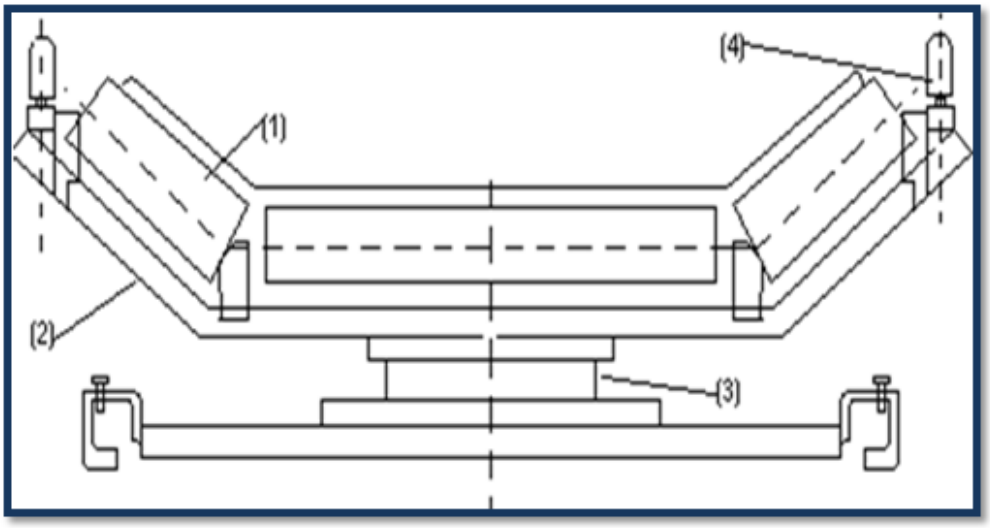

Fig.1. Centering idler or self-aligning-idler

Fig.2. Image of Centering idler or self-aligning-idler

Experimental set-up

This set-up consists of hydraulic control self-aligning idler with displacement sensor. Here the set up is similar to the centering idler but the efficiency and sensing capability increases with the use of hydraulic displacement sensor. This sensor detects the deviation of belt and provides the similar action of controlling the deviation as in self aligning idlers but with greater efficiency. The sensor controls the deviation of belt within its fixed

range but when the situation come that it is out of the sensor range it provide emergency stop to the system and induce an alarm so that the place of the fault can be easily detected and can be repaired with no time lose and prevent the damage of the belt.

Fig.3 shows the set of self aligning idler or the training idler that works for the controlling of belt deviation hydraulically. It is mounted with the idlers on both the sides of the conveyor i.e. at the carrying side and at the return side also, which consists of an ordinary troughed three roller idler, mounted on swivel frame (2), which is free to swivel within a limit about a vertical pivot (3). When the belt shifts off the centre, the edge contracts displacement sensor (1) which acts as a switch and allows the hydraulic fluid to pass through from the tube (4) and reaches fuel sump (3) from where it passes to main cylinder, with a slight pressure makes the idler to take a skewed position when a force acts which tends to steer the belt back to its central position. As the belt return to its central position, it automatically returns the idler to its initial position.
But in case the deviation of belt is much higher than the range of the displacement sensor i.e. when the cylinder elongation is at maximum position the sensor puts the conveyor on emergency stop and sets the alarm on. So that fault position can be located easily and can be rectified on time.

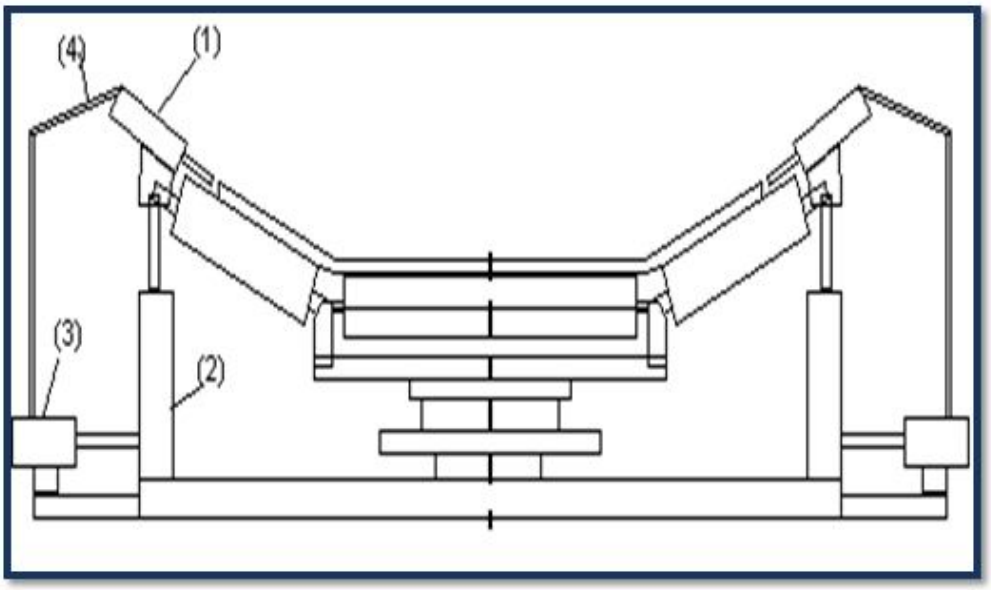

Fig.3. Hydraulic control self-aligning-idler with displacement sensor

Fig.4. Image of Hydraulic control self-aligning-idler with displacement sensor

Comparison of maintenance data on set-up

The data are taken from the thermal power plant where the system is set-up for recording the no. of working hour wasted in maintenance of the conveyor. The data are drawn under same working condition, under similar condition of belt and idlers.

Table 1. Maintenance Data sheet of 6 month

S. No.	Maintenance management	No. of maintenance work on Hydraulic control self-aligning-idler	No. of maintenance work on self-aligning-idler	Time for maintenance on Hydraulic control self-aligning-idler	Time for maintenance on self-aligning-idler
1	Breakdown maintenance (due to deviation)	1	4	3 hr	12hr
2	Breakdown maintenance (other breakdown)	1	2	2hr	3hr
3	Preventive maintenance	5	3	7hr	3hr
4	Scheduled maintenance	6	6	15hr	12hr
	Total	**13**	**15**	**27hr**	**30hr**

Result

The data sheet clearly shows that the no. of break down due to deviation that occurred in the mechanically controlled self aligning is much more then hydraulic control self-aligning-idler; hence the data shows that the advance system of controlling the belt deviation is much effective in controlling the belt deviation. The working hour wastage due to maintenance work on the advance hydraulic control self-aligning-idler is less than the time wasted on the mechanically control self-aligning-idler.

Conclusion

Based on the analysis of maintenance data of the two different structural components used for controlling belt deviation in conveyor system, working in coal handling plant of thermal power plant, it is clear that the new set-up of controlling belt deviation, compared with the present set-up on the maintenance ground is found out much effective. The maintenance data sheet clearly suggests that the maintenance work can be reduced up by using Hydraulic control self-aligning-idler and it also reduces the breakdown of belt due to deviation.

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