

Application Of Belt Winder For Conveyor Replacements In Coal Handling Plants Of Thermal Power Stations

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1.0 Abstract: -

Conveyors are seen on virtually all in the Coal Handling Plant (CHP) of Thermal Power Plant. These conveyor systems are the biggest problem for the plant maintenance engineer, being the cause of most plant shutdowns and interrupt coal supply to boilers results in loss of generation. The replacement of conveyor belts is usually a major event where a significant portion of the CHP operation is often brought to a halt for major. Conventional belt replacement programs involve clamping and cutting of the old belt, followed by reel –by-reel feed-in/feed-out of the new and old belt, respectively using wheel Loaders. As timing is of utmost importance in any plant shutdown, the belt changeup activity is more important.

This paper focuses on application of belt winder for conveyor replacement. A belt winder, which is proposed in this paper, should be designed with proper accessories for replacement of CHP conveyors. The system which is introduced in this paper to minimize time and manpower by developing system to remove old conveyor and inserting new at a glance with less time and manpower. The belt winder discussed in this paper is keeping view of replacement of conveyor belting of one of the CHP of thermal power station.

2.0 Introduction: -

Belt conveyor can be defined as a looped belt on which coal or other materials can be carried and which is generally constructed of flame-resistant material or of reinforced rubber or rubber-like substance. The major components of conveyor are drive unit, pulleys, idlers, take up units and structure with belting. The mountings of belt conveyors are scrapers and pull stop switch, zero speed switch. The most important component of a conveyor system is the belt itself. The maintenance of the belting is a complex job. Hot vulcanizing/cold vulcanizing is required to carry for the removal of the damaged section, followed by the insertion and splicing of a replacement piece. After some period when it is required to replace complete belting (one piece) the task become difficult due to pressure from plant operators to get "back on line of conveyor system as early as possible". Concept of replacing of complete length of belting with minimum pieces or no piece is because of reuse of the belt after reconditioning. Secondly it can be stored as emergency spare as there is usually some useful life is remain in old conveyor belt.

3.0 Conveyor Replacement Philosophy: -

In CHP the belt replacement program are carried out when one of the streams is under planed shutdown. The reasons of belt replacement are belt cover wear, damage of cords etc. The old belt is scraped, discarded or in some cases, kept as an emergency spare [1]. The value of keeping the old belt in one single length or minimum parts of length for extension of belt life by reconditioning.

4.0 Existing System: -

Using Wheel Loaders carries the existing procedure for replacement of conveyor belt. The conveyor take up is first lifted up to maximum height to release the belt tension. The replacements of conveyor belt are carried out in following stages.

- a) Replacement Arrangements.
- b) Clamping of belt
- c) Feeding of new belt
- d) Final pulling of new belt

e) Realizing of belt

4.1 Replacements Arrangements: -

The site for change out is to be selected by considering the area of Wheel Loader travel, new belt drum /reel placing positions & old belt laying facility. After selection of site new belt drums/ reels are required to shift from store and position on stand at the site. The lifting and clamping devices with splice equipment are also required to shift at respective position. The guide rollers are required to fit at proper position to guide the belt for correct path of feed out or feed in belt.

4.2 Clamping of belt: -

Generally conveyor belt is feed from carrying side. Two clamps are provided on carrying and return side. After this take up is lifted to release the belt tension. Then the belt is cut down at desired position of carrying side and the end of conveyor belt, which is towards head end, is temporarily spliced to new belt. The other end is clamped to Wheel Loaders after giving slight tension the clamps are removed.

4.3 Feeding of New Belt: -

Wheel loader is required to operate for pulling of old belt, which is to be removed, and at the same time old belt is fed out from conveyor system in one pieces or minimum pieces. After completion of one reel /belt drum, belt from other belt reel /drum will be jointed then and feeding will be going on. See Figure No 1.

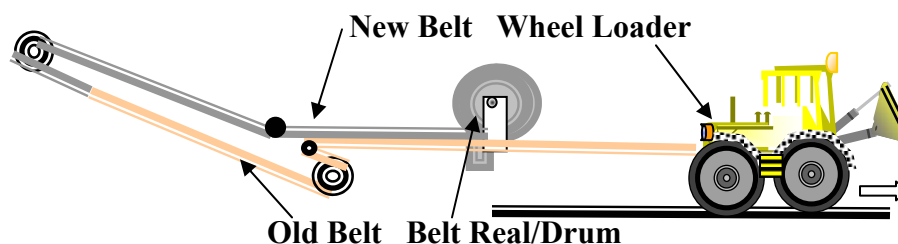


Figure No 1

4.4 Final Pulling of New Belt: -

After complete insertion of belt in system it necessary to remove sag of belting by clamping one end and other end by pulling with proper pull. After this last joint is to be taken out for making belt endless.

4.5 Realizing of Belt: -

The belt is to be released by realizing of take-up. All the arrangements are to be removed which are used for replacement of belt. Then trial of conveyor system is taken for satisfactory operation.

5.0 Suggested Belt Replacement System: -

Using Belt Winders can be carries the replacement of conveyor belt. Only some changes are to be carried out to suit the system. The belt winder should satisfy the following conditions.

1. It should be easily transferable to site.
2. Removing arrangement of old belt reel from winder should be easily and smoothly.
3. Arrangement for new belt reel/drum should be flexible to satisfy the different site condition.
4. The system should be maintenance free.

5.1 Silent Feature: -

To satisfy these conditions the belt winder will be having following features.

- Transportation of machine: -The machine should be easily transported by vehicle, which can be coupled to trolley. See figure no 2

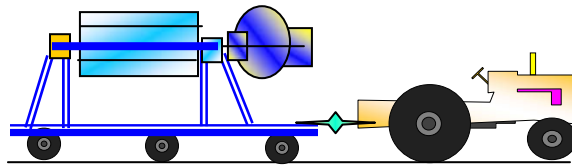


Figure No 2

After transporting at proper positioned it should be locked to avoid the movements.

- Locking of machine: -the machine is locked to the locking bolts by inserting lock bolts through holes provided to trolley. See figure no 3.

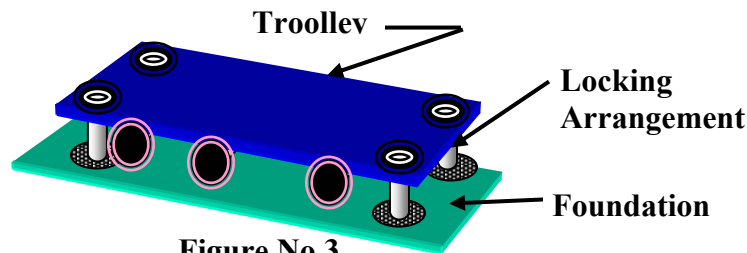


Figure No 3

- Capsule Insertion: - for collection of old conveyor in a reel a capsule is required. The capsule is inserted between drivers. See figure no 4

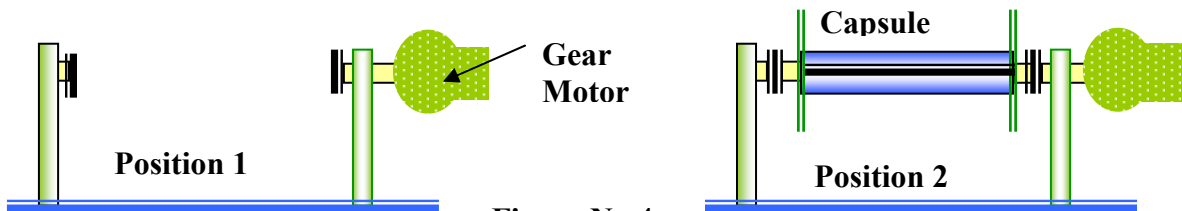


Figure No 4

- Belt Locking & Pulling: - the belt is locked by using two clamps and then cut down at proper position at carrying side. One end, which is towards head end, is clamped to new belt and other end is clamped to capsule. See figure no 5.

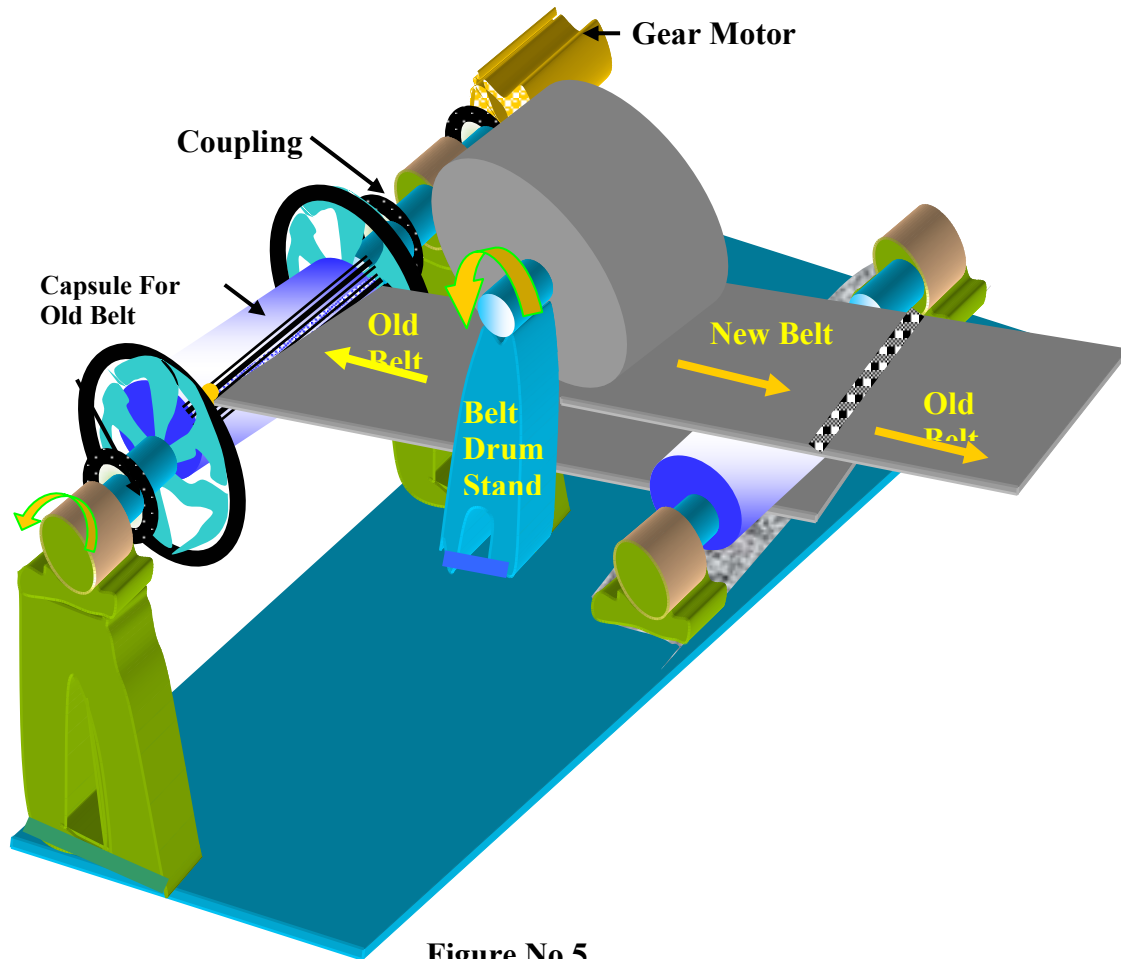


Figure No 5

5.2 Design Features: -

The machine is consisting of following main parts.

1. Gear-motor: - for giving power to driver
2. Drive Shaft: - to transfer the power
3. Capsule: -to removes and collect old conveyor.
4. Bed: -to bear load of old and new conveyor reels.
5. Trolley: - facility for transportation of machine.

5.2.1 Gear-Motor: -

The reduction gearbox should be built up of motor itself to avoid coupling between motor and gearbox. The alignment-free drive system has been proposed to improve reliability, and reduce downtime, installation and maintenance costs. The gear-motor for this should have following features.

Gearbox ratio = 80:1

Motor RPM = 1500

Power Required = 12 KW

Any suitable gear-motor available can be used for this belt winder.

5.2.2 Drive Shaft: -

The shaft, which transmits the power from gearbox to capsule, should have diameter of 80mm. The length of shaft should be such that the gear-motor can easily mount. The figure can easily clear idea of this shaft.

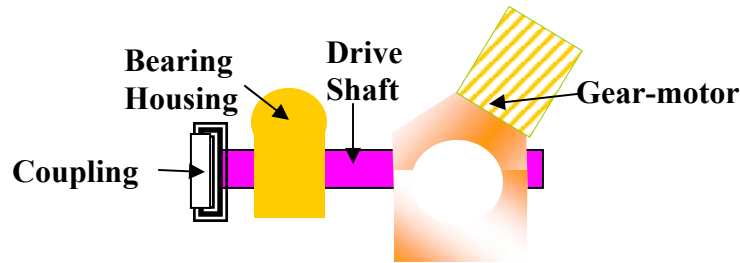


Figure No 6

5.2.3 Capsule: -

The capsule is use for collection of belt. The capsule will have capacity of winding belt up to 200 meter. Generally the real of new belt are received of 200meter. For each plant 3 to 4 capsule are required. This capsule should have following features

Capsule effective diameter = 200 mm

Width of capsule = 2000 mm

RPM of Capsule = 19

Torque at Capsule = 55KN

5.3 Operational Features: -

The Belt Winder simplifies and improves the control of replacement operation of belting. Winding speeds of between 12 and 30m per minute are achievable while capacities of up to 200m are possible.

6.0 Comparison Between Two Systems: -

Both the systems have their own merits and demerits. The table no 1 will show the comparison between these two systems.

SN	Activity	System With Wheel Loader	System With Belt Winder
1	Replacement Arrangements	Required wheel loader, chain blocks for lifting take-up,	Required belt winder, crane for lifting reels, transporting vehicle like tractor
2	Site consideration	Required area for wheel loader travel	No such area required
3	Special Arrangement	Required space for laying of old belt	Required anchoring arrangement for trolley
4	Power supply	No special power supply required	Power supply required for belt winder
5	Old belt storage	Required more space and complicated for transportation	Required less space and easy for transportation

Table No 1

7.0 Conclusion: -

The belt winder is useful in CHP as the time required to remove old belt is less and storage of old belt is easy task. Instead of directly purchasing belt winder it is useful to make available of data of conveyor system to manufacturer and ask manufacturer to supply as per need. It is more beneficial to develop the belt winder at site by using available resources.

Note: - The belt winder discussed is under primary development at site but within short period it is going to develop then actual results can be made available.

Reference: -

1. D.Foo, "Single Length Replacement of Overland Conveyors", Bulk Solids Handling, The International Journal of Storing And Handling Bulk Materials, Vol.5 No 6, December 1985, pg. 1185-1189