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ABSTRACT

Bulk handling conveyors are used to handle a vast array of materials in an efficient and safe manner. The alignment of the framework and components is the key to minimizing the costs of the conveyor operation. Laser Alignment provides a highly accurate method (.003" at 500') of aligning the frame and components of a conveyor system. Benefits of a correctly aligned system are reduced drive and non-drive pulley lagging wear, reduced belt cover wear, increased belt splice life, increased component life, reduced power consumption, and reduced spillage of material from the conveyor. Laser Technology can be extended to non conveyor applications such as tripper rails and structural foundation elevations just to name a few.

INTRODUCTION

Historically conveyors have been installed using the equipment available at the time. Levels and transits are the standard tools of the trade and organizations such as "Conveyor Equipment Manufactures Association" CEMA publish Conveyor Installation Standards that state that Conveyor Stringer Alignment can be plus or minus 1/8", the Lateral Offset can be off by 1/8" and the Level of the system can be plus or minus ¼" from a level datum. Pulleys can be out of level and out of square with the conveyor centerline by plus or minus 1/32".

After the conveyor system is installed and operating, minor adjustments are made to "Train" the belt. Training the belt requires the angular "Knocking" of a few idlers to get the belt to run in the center of the conveyor system. Most of the time operators are satisfied if the conveyor runs within the outside edge of the pulleys.

WHAT GOES WRONG

When a belt becomes such a problem that the operators just do not have a solution a company such as ours gets a call to help solve the problem. Usually the visible result of the problem is the misalignment of the belt. The damaged edges of the belt, the cut return roller brackets, the hot marks on the sides of the head chute and the spillage around the load zone area of the belt are all signs of poor belt tracking.

The causes of the belt mistracking are usually related to misalignment of the components on which the belt is running. Most efforts to correct the problem are aimed at making an adjustment to correct a perceived problem, such as moving a return roller to correct a belt that is running into the frame work on the return side of the belt. The problem may be more related to a misalignment of a head or snub pulley. Other factors that affect the alignment are worn lagging which effectively looks like a misaligned pulley to the belt.

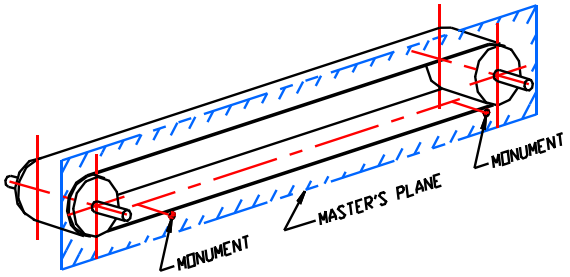
BASIC LASER ALIGNMENT

With laser alignment, vertical beams or planes of light are aligned with the centerline of the belt and perpendicular to the centerline of the belt. Then horizontal beams or planes of light are used to create a three dimensional coordinate system, from which measurements are made to the various components.

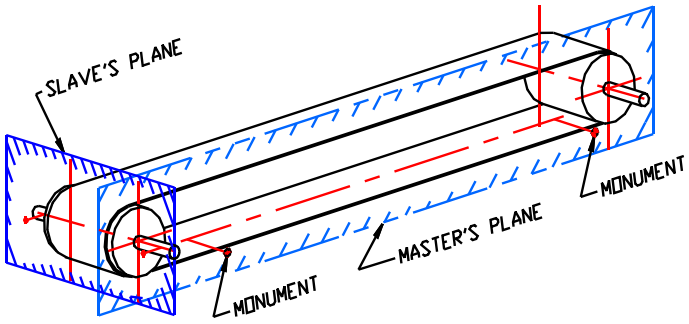
The first step is to locate the centerline of the tail and the head end of the conveyor. This centerline is then off-set from the conveyor to one or both sides. Monuments are then placed so that the centerline can be reestablished anytime in the future.

The first plane to set-up is the master plane which intersects the monuments and is therefore a vertical plane aligned with the longitudinal centerline of the belt.

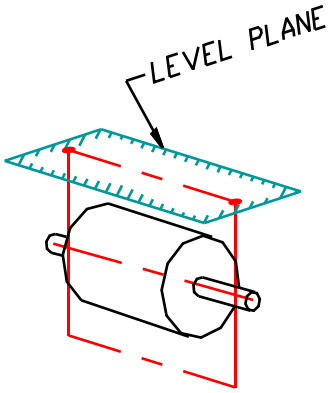
This master plane is used to measure the frame along the length of the conveyor to determine the deviation from the centerline. A deviation of plus or minus 1/8" or less is within the CEMA specification. Deviations in excess if the CEMA specification should be corrected.



The next laser planes to establish are the slave planes. The slave planes are composed of two elements, a single beam that intersects the master plane at all points and a vertical plane that is perpendicular to the master plane. These planes are used to measure the horizontal misalignment of components such as pulley shafts, troughing rollers and return rollers. Many times it is found that the surface structure that components are mounted to are out of alignment and the components have been mounted assuming that the bearing mounting surface is aligned properly.



The third planes that are set-up are horizontal, these planes are perpendicular to the master and slave planes and provide a point of reference to measure the deviation from one side to the other of pulley shafts, tripper rails and horizontal conveyor frames.



The data is recorded and the condition of the components and belt are observed and a report is written. The report documents the condition of the system and makes recommendations for correction of the problems.

Simple random misalignment of the troughing idlers and the return idlers will cause transient tracking problems as temperature and moisture conditions change. The belt may run just fine most of the time but changes in the coefficient of friction caused some of the misaligned components to have more influence on the belt than normal.

Many times when one pulley such as the head pulley is not aligned we find the snub pulley also misaligned in the opposite direction to compensate for the head pulley, this condition caused uneven lagging wear, belt cover wear, higher than normal bearing forces and high belt edge tension between the head and snub pulleys.