Case Study of Chain Conveyor Belt

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Abstract- The aim of this project is to make or increase the efficiency of the Chain drive conveyor belt of the company as good as new through our case study. This paper is about studying the different case and the factor affecting the conveyor belt through our study. This paper also taking the various factor such as the belt length, width, speed of the belt, motor power etc to see the condition of the belt from before. Through various calculation and literature reviews from this paper trying to fulfil objective of paper. This paper stating the various problems encounter through the study and provided with the technical solution.

This paper also about study of the various cleaning and maintaining processes for the conveyor belt for its long life. Also study about the precautions of the belt so as to avoid the further losses in the efficiency of the belt in the future.

INTRODUCTION

Chain conveyors use an endless chain both to transmit power and to propel material through a trough, either pushed directly by the chain or by attachments to the chain. The chain runs over sprocket at either end of the trough. Chain conveyors are used to move material up to 90 metres (300ft), and typically under 30 metres (98ft).

Chain conveyors utilize a powered continuous chain arrangement, carrying a series of single pendants. The chain arrangements are driven by a motor, and the material suspended on the pendants are conveyed. chain conveyors are used for moving products down an assembly line and/or around a manufacturing or warehousing facility.

Chain conveyors are primarily used to transport heavy unit loads e.g. pallets, grid-boxes and industrial containers. these conveyors can be single or double chain strand in configuration. The loads is positioned on the chains, the friction pulls the load forward.

Chain conveyors are generally easy to install and have very minimum maintenance for users.

many industry sectors use chain conveyor technology in their production lines. the automotive industry commonly use chain conveyors systems to convey car parts through paint plants.

chain conveyors also have widespread use in the white and brown goods, metal finishing and distribution industries. Chain conveyors are also used in the painting and coating industry, this allows for easier paint application. the product are attached to an above head chain conveyor, keeping products off of the floors allows for higher productivity levels.

LITERATURE REVIEW

1. J. Caban, et al, 2019, has presented the characteristics of plate conveyor in selection of operating parameter in juice transport process in a glass bottle.
   According the author this paper gives in sight on all technologies used in food industries to improve efficiency and accuracy with lower cost. It also emphasis on how robot can be used in place of human where the environment is not suitable for humans.
   In the last the paper presented as the rightful conditions how a juice bottle can be transported by plate conveyor. he discussed the parameters such as right linear speed, the angle of inclination should be right & also positions of center of gravity.
   Finally, he concluded that set of standard range of all the parameters till which it can operate properly.
2. Dr.v.k.Matsagar,et al, 2022 has discuss that how an economical conveyor systems can be used in place of traditional methods. India is an agriculture-based country. to stand in today's world of competition no need solution that are affordable rapid and safe loading with minimal human interaction. the modern method is easy to installed, handle and works better forklifts and another similar handler. finally he concluded that, in order to decrease material handling time efforts and transportation cost in transportation system. this is one of the efficient ways of the farmer can use.

3. Omkar.P. kumbhkar, et all,2020 has detailed brief information on redesigning of critical parts of the roller belt conveyor used in the industries for reducing the weight and power comsumption.in the modern industries conveyor belt is been used heavily. These required heavy missionary and proper maintenance for this, for which attaining profit is significantly stubbed. for this purpose, it is important to reduce energy and energy cost of material handling. this process is based on including the efficiency of energy of belt. the detail study focuses on the optimization of critical parts like belts,roller-shaft,frame , c-channel, bracket and by using the different material such as belt roller and analyze it to minimize the assembly weight without changing it structural strength with the help of proper finite element model using software like CATIA.
4. Swanand Appaso Dhanawade, et al,2017 material handling is an integral part of heavy-duty industries. The handling system consists of the paper emphasis the fact that belt conveyor is used to transport material from one location to another. the main objective of the conveyor belt system is aimed. at the transportation of determine quantity of handled material within defined period between the specific loading and unloading location. Here they have shown about the improvement of energy efficiency of belt conveyor and also, they have given solution on more weight and power consumption.

METHODOLOGY

The aim of the project is to increase the efficiency of the conveyor belt. For that we had gone through the various process and technique. We first started with considering the condition of the belt conveyor with the newly installed one. We have just identified the problem of the present conveyor belt and studied how to make the belt in its ideal form.

Basically, work on the design and its physical strength. The following methods is used: -

- Calculated the speed ratio to adjust the of the conveyor belt to maximised its efficiency. $\frac{N2}{N1} = \frac{D1}{D2}$, $N2 = 600rpm$
- Calculated the velocity ratio by considering the creeps and slips of the belt to adjusts and modify to improve the belt structure. $V = \frac{\pi D1.N1}{60}\left[1 - \frac{S1}{100}\right]$, $\frac{N2}{N1} = \frac{D1}{D2}.\frac{E+\sqrt{\delta 2}}{E+\sqrt{\delta 1}}$
- Calculated the velocity ratio of the compound belt drive. $\frac{N2}{N1} = \frac{D1}{D2}$, $\frac{N3}{N4} = \frac{D4}{D3}$

Suggested some maintenance and measures for the long life that listed below in the solution section. Thus, with the simple precautions we carried out study and with the listed method we completed our case study and suggested with the possible solution listed below.

PROBLEM AND SOLUTION

- During the first visit to the industry and interacting with the operator and engineers working on the plant. The problem arises with the conveyor belt, as informed by the engineers, the conveyor belt provided by the industry was found to be older and had been in use for a longer period.
- The problem faced by the conveyor is that the load capacity has halved from 1200 kg to 600 kg, the operating speed has decreased and the working efficiency has decreased.

With many conveyor systems running 24/7 in critical traffic, a common conveyor belt. The problem can cause serious problems leading to device damage. Unnecessary downtime and work accidents.

6 common conveyor belt problems

1. Conveyor belt tracking problem
2. Belt slippage
3. Blockages
4. Carry back
5. Material spillage
6. Seized rollers

Problem 1: - Conveyor belt tracking issues

Reasons: Conveyor belt tracking issues often referred to as conveyor belt mis tracking. This occur when the belt is no longer aligned with the proper path and pulls to the one side or the other.

Solution: -

Regular top inspector of this areas and check for the signs of mis tracking.

Keeps the belt clean, repair damages as it arises and make sure loads are properly cantered to avoid major issues and a long shutdown period.

Problem 2: - Belt slippage

Reasons: -
Uneven balance of loads leaving to little or too much tension can cause belt slippage. Cold temperature which lowers the grip between the pullies and the belt. Overweight loads which strain the belt, causing it to slip. Pullies issues which can include a worn had pulley that are smooth.
Solution: -
Lagging is often installed on pulley to create the proper tension. If improperly implemented, it too can cause belt slippage.
Ensure, your belt weight range matches the weight of the products. You are moving and regularly inspects the belt and pullies for the common causes of belt slippage. Repair this as soon as you find them.
Using idler gears to ensure tightness of the belt.

Problem 3: - Blockages
Reasons: -
Sharps edges, corners and surface can snag an object, causing a pile up as items begin together. An unexpected accumulation of products can damage items and force the entire system to shut down.
Solution: -
Regular inspection of conveyor line for anything that could interface with product movement and correct it from promptly.
Problem 4: - Carry back
Reasons: -
Occurs when extra material sticks to be the transporting belt, pullies, rollers and idlers.
Solutions: -
Install belts cleaners or brushes that dislodge stuck material before it become an issue.
Problem 5: - Material slippage
Reasons: -
It is not uncommon for a material to slid off a conveyor belt particularly at parts where loading and unloading occur. The lost material increases equipment's wear and lowers productivity. It also presents a significant safety hazard. Since, loose material can cause employers to slip or fall.
Solutions: -
Prevent excess material slippage by installing impact beds or skirt clamps.
Problem 6: - Seized rollers
Reasons: -
Cause the belt into midtrack create a safety hazard damage the object being transportation close to the centire system.
Solutions: -
Identify rollers that are likely to sized allowing you to replace them before issues sized.

CONCLUSION

At the result has been obtain following this analytical approach but also the personal ideas.
A conveyor belt is the material handling device which use to transport the product from one designated place to another. This system consists of the two pullies from which one pulley is attached to the powered with a driver (electric Motor) and the belt is mounted on the pulley and this system is known as the conveyor belt system.
There are different types of conveyor belt from which we studied the **chain drive conveyor belt.** A chain drive is a device widely used for the transmission of electricity where shafts are separated by a distance greater than that for which gears are practical. Chain driven roller conveyor are an excellent solution for moving large heavy units or palleted goods. This type of conveyor is driven by a motor connected to a chain. The chain runs along a set of rollers, each fitted with sprockets.
Chain drive conveyor belt have the wide variety of application. Some of the followings are as follows below: -
Bicycles, motorbikes
Agricultural machinery, machine tools
Coal cutter and other power transmission devices
The industry we visited has the chain drive type conveyor belt in the production department. They the conveyor belt after the packaging to move from one place to another. After the long analysis and frequent visit, we consider the belt in ideal condition (new machine) and the practical condition (current machine).
We noticed the very big difference in the term of reduction of efficiency in the belt conveyor. This reduction in efficiency was due to many factors we encountered during our analysis.
So, we have done various analysis for thus the problem arises due to wear and tear of the machine by the time. And solved with the appropriate methods.

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