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# SLIP HANDLING ON CONVEYORS TO EXTEND THE LIFE OF CONVEYORS AT THE DEPARTURES TERMINAL

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**Abstract**

*The departure terminal's Abdulrachman Saleh Malang Airport has facilities as an improvement in services for airplane passengers, such as aviobridges, escalators, travelators, elevators, and conveyors. Conveyors are mechanical systems that transfer luggage considerably from one location to another. To facilitate routing procedures, an effective model for conveyor operations must be developed, as well as the maintenance operation. This study aims to determine the consequences of lack of maintenance on the conveyor belt, namely the occurrence of slack in the belt so that it continues to experience abrasions on the sides of the conveyor and tears on the edges of the belt. The tear causes the fibers to unravel so that slip occurs between the belt and the upper idler shaft (carry idler) so that the idler cannot rotate. This causes the conveyor belt to run and malfunction. This research uses a qualitative method of conducting an exploratory study of the conveyor belt using experimental description research by describing and analyzing the existing conditions on the conveyor. The result is that there are belt fibers that cause slippage on the conveyor. Handling that can be done is cutting the fiber belt. The conclusion is that many factors can cause slippage on the conveyor belt, such as too heavy a load, old belt age, and the distance between the collecting belt conveyor and the transfer line conveyor. Maintenance can be done on the equipment to avoid slippage on the conveyor. Conveyor maintenance activities consist of two types, namely unplanned maintenance and planned maintenance. Unplanned maintenance is also called reactive maintenance or emergency maintenance.*

***Keywords:*** *belt conveyor, slip belt, maintenance, departure terminal*



## Introduction

The departure terminal's Abdulrachman Saleh Malang Airport owns several facilities as an improvement in services for airplane passengers, such as aviobridges, elevators, escalators, travelators, and conveyors. Aviobridge is a bridge connecting the gate with the aircraft. Elevators are tools used to move goods or people vertically. An escalator is a tool for carrying goods or people in the form of steps. At the same time, the travelator is a tool with the same working principle as the escalator but a different pallet shape the travelator pallet clashes with the flat plate.

Conveyors are mechanical system that transfers luggage considerably from one location to another. In the industrial sector, conveyors are also utilized to transport materials (Martinetti et al., 2017; Sorouri & Vyatkin, 2016).

There are various conveyors at airports according to their use, namely Baggage Departure Handling System (BDS) and Baggage Arrival Handling System (BAS). BDS system moves passenger baggage from the check-in counter to the plane. The main parts of BDS are: the weighing scale conveyor, collecting belt conveyor, transfer line conveyor, drive conveyor, and roller gravity. Besides that, BAS is a system that moves passenger baggage from the aircraft trunk to the arrival/baggage collection hall by the carousel conveyor, including the BAS conveyor (Rizal et al., 2018).

Passenger baggage must undergo several stages, namely weighing the baggage weight on the weighing scale conveyor and then labeling baggage ownership on the collecting belt conveyor. After the process, the baggage will be transferred via line conveyor transfer. This conveyor is the longest conveyor than other conveyors because it is a path from the check-in counter to the ground handling.

Delivery service quality depends on a conveyor's ability to run as efficiently as possible at distribution facilities. Routing a certain number of products from loading to discharging locations in the quickest amount of time constitutes optimizing conveyor operations. To facilitate routing procedures, an effective model for conveyor operations must be developed as well as the maintenance operation (Kristian, Mulyono, & Santosa, 2021). One result of the lack of maintenance on the conveyor belt is the occurrence of slack in the belt, so it continues to experience friction on the conveyor side and tears on the edges of the belt. The tear causes the fibers to unravel so that slip occurs between the belt and the upper idler shaft (carry idler) so that the idler is unable to rotate. This causes the conveyor belt to run and malfunction.

The problem of not running a belt on the conveyor is called slippage. Slip handling is a step to prevent and repair slips on the conveyor belt. There are several ways to handle slip on the conveyor. For example, adjusting the tightness of the belt, limiting the load on the belt conveyor, and checking regularly. Therefore, handling a slip to extend the equipment's life is necessary by conducting proper maintenance.

The purpose of this study was to determine the damage to the conveyor. After knowing the obstacles experienced, the factors that cause damage to the conveyor are sought. After knowing the factors that cause damage to the conveyor, preventive and repair steps can be taken to extend the equipment's life. In addition to extending the equipment's life, prevention also improves the performance of the equipment when used.

## Methods

The method used in this paper is a qualitative method of conducting an exploratory study of the conveyor belt (Franciosi et al., 2020). The exploratory case study and research approach use qualitative case study methods used to obtain information on the damage that occurs on conveyors and how to deal with the problem. The nature of experimental description research by describing and analyzing the existing conditions on the conveyor.

The research was conducted for six months at the departure terminal's Abdulrachman Saleh Airport in Malang. Abdulrachman Saleh Airport is located in District Malang Regency, 17 km east of Malang city center, and its astronomical location is at the point/position of 07.55 South Latitude and 112.42 East Longitude. That was observed on the departure conveyor, namely the transfer line conveyor.

From the observations, the transfer line conveyor was found damaged. Namely, the belt could not rotate as usual. In this case, the research indicated that there was damage to the conveyor motor. After observation and checking on the motor, it turned out that there was no problem because the motor could still start and run as usual. Then, tries to open one side of the conveyor frame to check whether there is a problem from inside the conveyor. After observation, it turned out that the belt

material was found to be transported in the carry idler conveyor shaft, and the presence of torn belt parts on the conveyor.

**Results and Discussions**

The conveyors in the departure terminal of Abdulrachman Saleh Malang Airport have electrical and mechanical components. The electrical components on the conveyor consist of electric motors and sensors. The conveyor uses a 3-phase motor as the primary driving device. A motor is a machine tool that converts electrical energy into motion energy (Bhatt, Mehar, & & et al, 2019; Küçüktabak, Kim, Wen, Lynch, & Pons, 2021). The motor will move the pulley component, which causes the belt to move. At the same time, the mechanical components consist of pulleys, belts, rollers/idlers, and frames. The pulley is a belt drive, so it can move. That works directly by using energy from the motor placed on the conveyor (Van Zyl & Al-Sahli, 2013).

This conveyor uses two types of pulleys: head pulleys and tail pulleys. The belt is one of the main elements in the movement of goods that pass through the conveyor. The strap is made of various materials, such as steel, nylon, cotton, rubber, and others (Szurgacz et al., 2021). The conveyors in the departure terminal of Abdulrachman Saleh Malang Airport uses rubber strap, called belt. The belt must meet the requirements, namely low water absorption ability, high strength, light weight, flexibility, minor strain, high layer separation resistance, and service life (Webb et al., 2013), the long one. The roller is part of the conveyor belt and functions to support the running belt. It does not use a drive and moves only because of the friction of the belt running on it. These rollers are supported by the framework of the general belt conveyor structure. This roller supports the load of the belt that carries the material on the conveyor belt (Król, 2017).

During observation, we found one result of the lack of maintenance on the conveyor belt is the occurrence of slack in the belt, so it continues to experience friction on the conveyor side and tears on the edges of the belt. The tear causes the fibers to unravel so that slip occurs between the belt and the upper idler shaft (carry idler) so that the idler is unable to rotate. This causes the conveyor belt to run and malfunction. Therefore, it is necessary to handle a slip in order to extend the life of the equipment.

Factors that cause slip: First, an old belt can increase the likelihood of tearing because the elasticity of the strap has decreased since it was first used. Second, a belt that has been used for a long time will also affect its condition. The third is the lack of maintenance on the conveyor belt. Treatment that can be done to extend the life of the belt is to check the tension on the conveyor belt so that miss-tracking does not occur and clean the belt using a rag and a vacuum cleaner if there is water or dust attached to the belt (Trojan & Marçal, 2017). Fourth, there is heavy pressure on the conveyor belt. If the belt carries too much pressure, it will increase the belt tension so that the friction on the belt is also more significant and can cause tearing (Lubis et al., 2022).

**Figure 1.** Conveyor belt damage

Fifth, there is a difference in dimensions between the collecting belt conveyor and the transfer line conveyor, so there is a gap between them. The hole causes one of the rollers in the passenger's suitcase to get stuck, affecting the function and work of the belt (Bebic & Ristic, 2018).

**Figure 2.** Dimensional difference between Collecting Belt Conveyor and Transfer Line Conveyor

There are several steps to dealing with slips on the conveyor. First, ensure the conveyor is OFF by pressing the STOP button on the START system. Prepare a toolkit for disassembling the conveyor frame.

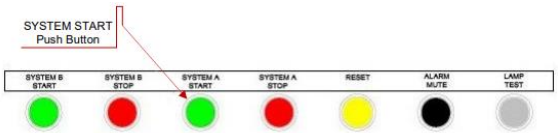


**Figure 4.** Start Button System

Next, open one side of the frame using a screwdriver. Ensure all bolts removed are not scattered and do not get into the conveyor frame.

**Figure 5.** Frame dismantling process on the conveyor

Then, check the inside of the belt conveyor with the help of a flashlight to see where the torn material is stuck.

**Figure 6.** The inside of the belt

After that, pull out the torn belt material stuck between the idler shafts and then cut it using a cutter.

**Figure 7.** Cutting the damaged part of the Belt

**Figure 8.** Frame closed

Finally, it closes the frame side of the belt conveyor. Make sure there are no tools left around the conveyor and readjust the tension on the conveyor. After knowing the factors that caused the slip on the conveyor belt and dealing with the problem, the Abdulrachman Saleh Malang Airport mechanical team performed maintenance on the equipment. Conveyor maintenance activities consist of two types, namely unplanned maintenance and planned maintenance. Unplanned maintenance is also called reactive maintenance or emergency maintenance. It is maintained with respect to unexpected cases and leads to high maintenance costs. Besides that, the planned maintenance strategy is widely used in maintenance management. The basis of planned maintenance is reliable and accurate data. Management normally plans its maintenance work properly, especially the person in charge of monitoring the maintenance work (Rani et al., 2015).

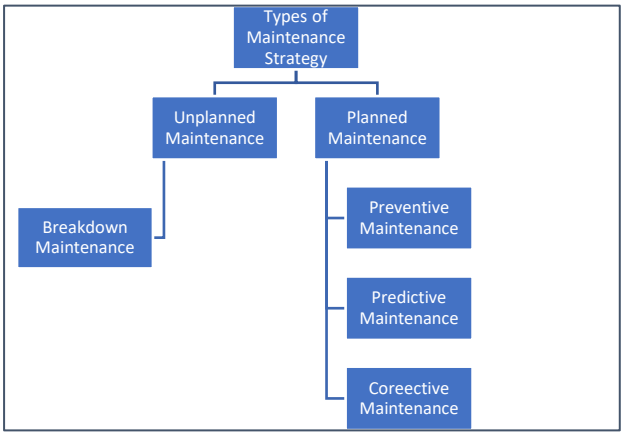


**Figure 3.** Types of maintenance

Preventive maintenance is better than corrective maintenance because it plans ahead and reduces the maintenance cost of major damage. Downtime can be minimized and improved, improving asset safety. Preventive maintenance consists of daily maintenance, weekly maintenance, monthly maintenance, quarterly maintenance, semester maintenance, and annual maintenance. Daily maintenance such as first checking the cleanliness of the equipment and the surrounding area. Second, perform equipment function checks and operation button function tests. Third, make sure to check the function of the scales (Blazej & Jurdziak, 2017).

Weekly maintenance consists of checking the electric current in the driving motor while running and evaluating if there are irregularities. Monthly maintenance, check the function of each limit switch/sensor device, and replace it if damaged, check the belt's condition and repair it if there is no flashlight, check and measure the vibration of the driving motor, and an operation panel inspection, check all components.

Quarterly maintenance such as performing oil surface checks and oil leak detection on any equipment, such as motors and gearboxes, checking and testing the accuracy of the weighing device, perform an inspection of the electrical wiring system and equipment control. In addition, semester maintenance is carried out, namely adjusting the sensitivity and time of all equipment according to the settings in the manual book. Annual maintenance consists of performing a thorough inspection of the physical condition of the equipment and painting it if necessary, performing lubrication on any moving equipment, such as motors and gearboxes, checking the accuracy of conveyor scales and calibrating them if necessary (Szrek et al., 2020).

Belt maintenance on conveyor belts must also be carried out routinely, as with other components. Manpower must carry out routine activities every day in the maintenance of belt conveyors, namely daily inspection, monthly inspection, and annual inspection (Maidi, 2022). In this research, we already know that handling conveyor belt slippage can be done by cutting the conveyor belt fibers. After the damage is resolved, preventive maintenance steps are taken, such as a daily, weekly, monthly, quarterly, semester, and annual maintenance.

## Conclusion

From the observations, there is a problem with the conveyor belt, which is experiencing slippage caused by a lack of maintenance on the conveyor. Therefore, we can resolve issues by cutting the fiber or torn part of the belt and carrying out periodic

maintenance following existing Standard Operating Procedures. In addition, there are other factors that can cause slippage on the conveyor belt, such as too heavy a load, old belt age, and the distance between the collecting belt conveyor and the transfer line conveyor. To extend the life of equipment, maintenance should be done regularly. In addition to extending the life of maintenance equipment, it also functions to check the condition of the equipment and whether there is damage.

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