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COAL TRANSPORT THROUGH THE CONVEYOR BELT: LITERATURE STUDY OF PROCESS AND SUPPORTING FACTORS

Niken Devi Rosita[1*]

[1] Indonesian State Maritime Polytechnic

[*] E-mail: nikendevi@polimarin.ac.id

ABSTRACT

Transportation through sea transportation modes can be carried out to the side of the port and transported further by trucking mode or by other transportation systems, namely using a conveyor belt or belt conveyor that will deliver the cargo directly to the stockpile field or other places. A belt conveyor is a device that delivers bulk cargo to the destination of shelter or stacking. Transportation of one of the loads, namely coal using a conveyor belt by unloading the cargo using a crane to insert the cargo into the conveyor belt. Based on literature studies and field observations from research related to belt conveyor operations, supporting factors for the smooth operation of conveyors include belt width on the belt conveyor, type of idler, angular accuracy, gearbox speed, and density of each load. In addition, periodic maintenance and maintenance factors can reduce the risk of obstacles related to belt conveyor operations, including belts that suddenly jam, and loss of cargo (losses) causing losses and fines. Periodic maintenance and maintenance should be outlined in the Planning Maintenance System which must be complied with and needs to be supervised for implementation. Periodic audits are important to carry out the fulfillment of procedures in the field and checks on the condition of the equipment to minimize losses due to damaged equipment.

Keywords : *Conveyor Belts; Process; Supporting Factors*

INTRODUCTION

Transportation of goods through sea transportation is the main choice for goods owners who send goods on a large scale. Sea transportation was chosen because it tends to be cheaper and can carry a large capacity compared to other modes of transportation. Indonesia has many companies engaged in shipping and maritime services. The company handles loading and unloading issues, ship services, procurement of spare parts, and services for providing human resources employed on ships.

Ships are a mode of sea transportation that can reach remote areas. The type of ship used for transportation is adjusted to the cargo to be transported or unloaded. Ships used for transporting cargo in large quantities are not intended to carry passengers. The ship to be used is also adjusted to the type of cargo being transported where the cargo is divided into liquid, solid, and gas cargo.

Transportation by sea transportation mode is carried out by involving various parties. The parties involved include ship owner companies, loading and unloading service providers, heavy equipment supply companies, and agencies around the port. Transportation can be carried out to the side of the port so that it is unloaded right beside the port and transported further by truck mode (trucking). Another cargo transport system can be done using a conveyor belt or often referred to as a belt conveyor which will deliver the load directly to the stacking yard or another place.

One example of dry cargo (dry bulk cargo), namely coal, where the unloading and transportation activities can use trucks (trucking). Operational coal that is unloaded for a consumer, for example, a Steam Power Plant (PLTU) can be through trucking and can be transported via a belt called

*Corresponding Author

a belt conveyor or a conveyor belt that is covered at the top. Unloading coal with a belt conveyor will be taken directly to the stockpile where the coal is unloaded from the hold using a backhoe excavator and immediately put into the belt conveyor machine through the crushed machine and then to the stockpile.

From Yulia, et.al (2018) explained that a conveyor belt is a tool intended to move materials in the form of sand, gravel, and crushed rock where the capacity of the material to be moved by the conveyor belt is very high because it is carried out continuously at a relatively high speed. Belt Conveyor is a tool for moving goods that can operate continuously with a long distance of 500-1000 m or more with a fixed trajectory and materials that can be transported can be in the form of bulk loads or unit loads. relatively light machine and easy maintenance and operation (D. Suryadi, 2018). Belt conveyors are used for the mobilization of bulk goods, for example, soil, sand, gravel, crushed stone, and concrete. The material transfer capacity by the belt conveyor is quite high because the material is moved continuously at a relatively high speed.

Most of the loading and unloading of coal for consumers from the Steam Power Plant uses a belt conveyor to speed up unloading. For ports related to the effectiveness and efficiency of choosing trucking or belt conveyors, summarized Shiddiqi & Kasim (2018) that the transport capacity on the conveyor belt is greater than trucking, but in terms of cost efficiency it is concluded that trucking is more economical due to the costs incurred related to the use fewer combinations of tools. The conveyor system mode is considered better based on research (Rudianto & Hartanto, 2019), especially for operational terrain that has steep terrain. Conveyor belt operations in achieving production targets can experience obstacles if maintenance of the long belt conveyor line is not considered and belt size uniformity is ignored (Al Risqi, Farihah, & Zahar, 2021). An analysis of the feasibility of investing in the purchase of dump trucks and conveyor belts for the transportation of bulk gypsum is described by Alwi, et.al (2021) where the purchase of both tools is worth considering and has not answered the problem of tools that are considered more optimal in the material handling process. Findings related to support for the use of *conveyor belts* and investment analysis related to optimizing coal transportation will be developed through a literature study by highlighting several previous studies and the latest information related to loading and unloading at the stacking field.

According to research from Jamaluddin (2011) related factors that can affect the actual productivity of the conveyor belt: the surface area of the material on the belt which is affected by the conveyance material carried, both type and size; The process of feeding the feeder where the greater the production; feeding the feeder then the greater the transport production from the conveyor belt, if the feeding process is not optimal then the production from the conveyor belt will also decrease; looses on the conveyor belt where looses or losses can be caused by the expansion of the belt that is too hot, wet belt conditions can cause coal material to stick to the belt and can also be caused by falling coal material to the side.

Based on some studies earlier related to operational conveyor belts in transport payload bulk specifically coal so topic to be lifted is related to the description of the transport process as well as factor supporters achieving the target amount of cargo.

According to Saryono (2010), Research qualitative is research used to investigate, discover, describe, and explain quality or privileges from social influences that are not can describe, measured, or depicted through a approach quantitative. Qualitative research related to coal loading and unloading operations through belt conveyors was carried out using descriptive analysis techniques using literature studies in digging up data with sources from scientific articles, reference books, and related company profile pages. Literature studies in research center on factors, ways of working, and obstacles to the loading and unloading process through belt conveyors. The stages in this literature study consist of preparing the necessary tools, preparing a bibliography, time management, and reading and recording research materials (Adlini, Dinda, Yulinda, Chotimah, & Merliyana, 2022).

RESULTS AND DISCUSSION

Facilities that can be used to support the smooth process of unloading coal include heavy equipment, stockpiles, and belt conveyors to speed up distribution to the kitchen or stockpile. In the stockpile, there is a process of stockpiling coal, where the process is one of the important stages in the coal loading and unloading process before the coal will be used as an operational raw material supply.

Several mining companies and transporters engaged in coal transportation provide conveyor belts as the main tool in the handling system which plays a role in distributing or transporting coal from the loading and unloading area to the coal bunkers. It is shaped like a long belt that can be walked as a means of transportation. There are several important parts such as conveyor belts, motors, pulleys, and reducers.

Belt conveyors are very important to speed up the coal distribution process to and from ships and other modes of transportation. Coal can be transported from mines and processing plants to consumers in several different ways: Conveyors, trams, and trucks move coal around the mine, for short distances from the mine to consumers close to the mine, or to other modes of long-distance transportation.

Conveyor belts are used in industry to move bulk cargo along a predetermined line and the belt that is installed is adjusted to the material to be transported. Belt requirements based on research Aosoby, et.al (2016) required not to absorb water, have good strength, are lightweight, have low specific elongation and the belt must be flexible.

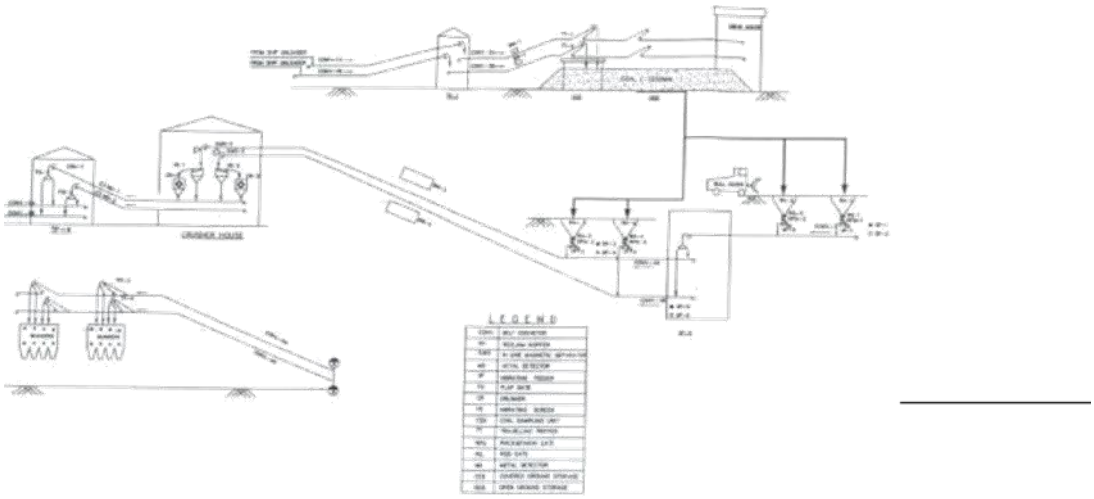

Figure 1. Coal Transportation Through *Conveyor Belts*

a transport process of coal unloaded from ships for transportation use conveyor belts to go to field buildup or called stockpile. Based on exposure from (Lesmono, n.d.) in connection with the procedure transporting coal from a docked ship will use cranes To transport the payload into the conveyor belts going to the stockpile. Many field buildup coal own conveyor belt on the side dock so which make it easy in the process of unloading the load. Other related conditions ship that did demolish fit, as well as transportation to the anchorage area, so owns several possibilities including payload coal dismantled using the ship's crane or floating cranes into the barge (barge) for then the barge brings the payload to dock approaching the conveyor belt area. Another condition is the placement of conveyor belts conditioned to the anchorage area during allows.

In the process of transportation coal researched by Hayati, et.al (2017) explain productivity actual of the conveyor belt is determined by the area material surface on the belt which is affected by the conveyance material, coefficient swipe as well as density, next other influencing factors ie feeding in the inner feeder matter This if supply walks fluent so productivity will maximum and other factors

assessed important ie security at the time payload the transported through conveyor belts Where threat loses can happen good because the condition of the belt which is not adequate.

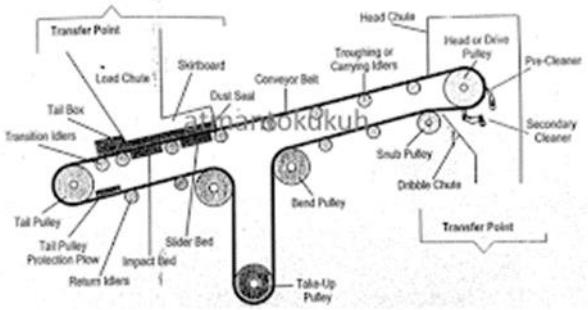

Figure 2 . Component *Conveyor Belts* (Swinderman , Todd , Goldbeck , & Marti, 2002)

Reporting from the book of CEMA, 2007 that the conveyor belt has components including :

1. Drive pulleys ie useful pulleys _ salute energy motion turn on the belt For move.
2. Tail Pulley and Head Pulley in section end in front of the belt and some are used as the drive pulley while the tail pulley is located at the end behind the belt and does not turn directly by the drive unit but follows the moving belt..

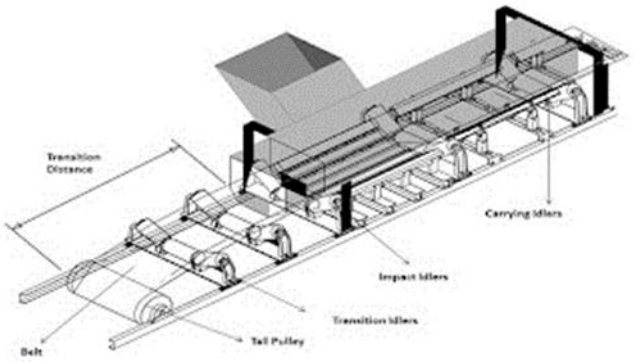

Figure 3 . Construction *Conveyor Belts* near *Loading Chutes* (CEMA, 2007)

3. Snub pulleys used For enlarging corner winding of the belt on the drive.
4. Working bend pulley arch direction belt
5. Take-up pulley where pulleys this combined with system take up.
6. Belt which is a partial cross-section and transports the material from the end to the other end of construction conveyor belts.
7. Useful idlers for withholding belt on section carrying and return.
8. Take up unit which is an installation used for maintaining belt tension.

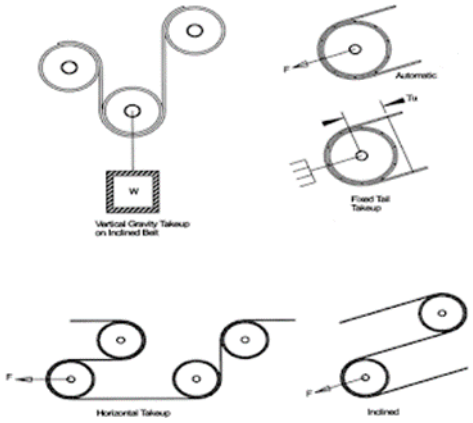

Figure 4 . *Take Up* Unit (CEMA, 2007)

9. Purposeful skirt boards for forming pile coal as well as leveling pile coal until can balancing speed belt.

Factor supporters productivity belt conveyors which are based on belt area is also conveyed by Barus, et.al (2017) which explains that a wide belt on a conveyor belt gives a mark range high haul _ compared to a speed conveyor or idler angle. That also explained that capacity conveyor belts will the bigger If accompanied by an enhancement corner idler, the speed of the conveyor as well as wide belt or belt.

Bimasakti & Hasjim (2019) study related use of belt conveyors for hauling limestone _ explains that influencing factors _ of performance conveyor belts including type idler, limestone surcharge angle, and type idler; factor slope of the conveyor belt, drive pulley, speed of the gearbox as well as mark density of limestone. In the research, they explain also that No achievement mark targeted production _ is caused by conditions crushers, condition of a full stockpile as well as time cleaning and maintenance in between times operational.

Damage conveyor on activities transport coal by PT. Indo Mining Raya Magnificent described by Suryadi & Setyawan (2023) can hinder the activity process transshipment Where damage causes activity transport to stop. The activity stopped transport impacted the shipping carrier the required load time lean longer so besides the cost dock, the dock will fees are also charged demurrage against PT. Indo Mining Raya is magnificent as shippers. Completion of problems in research with notice timetable maintenance tools especially conveyor belts as well as optimizing cooperation whole party related.

CONCLUSION

Research related to the transportation of dry bulk cargo by sea transportation using belt conveyors, including the loading of gypsum, coal, and bulk cargo, resulted in several conclusions, including the supporting factors for optimizing the quantity of cargo, namely the width of the belt on the belt conveyor, idler type, angle accuracy, gearbox speed. as well as the density of each charge. The prime condition of the conveyor belt cannot be separated from periodic maintenance and maintenance outside the operational schedule and is routine. Some damage to the conveyor is generally caused by the nature of the cargo, the condition of the belt, and the conveyor engine sequence so the damage results in delayed ship operational schedules and results in demurrage. Apart from causing demurrage, in several conditions, the coal loading required for PLTU raw materials resulted in delays in the supply of electricity in the affected areas.

To minimize obstacles at the moment transport so maintenance as well as periodic maintenance should pour in a mandatory Maintenance planning system obeyed as well as need supervised its

implementation. Periodic audits are important for done to fulfillment of procedures in the field as well as an inspection to condition tools so that can minimize loss consequence equipment broken.

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