# Analysis of Downtime Problems on Elevator Machine at PT. Santosa Utama Lestari using Tree Diagrams

**Ismi Mashabai[1)], Andi Mustika Irahayu Asran[2)]**

[1-2)] Faculty of Systems Engineering, Sumbawa University of Technology

*Correspondence Author: ismi.mashabai@uts.ac.id*

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**ABSTRACT**

*Downtime is a condition in which the machine stops operating not on scheduled stops but due to a disturbance that occurs on the machine, so the machine will be idle until the machine has been repaired or is not in a state of disturbance. Downtime is when production equipment is not functioning due to a sudden inspection and repair of damaged equipment. Elevators can raise the material to a height of up to 50 meters; the capacity can reach 50 m3/hour. The construction can reach a vertical position. The working principle of this tool is to move the material vertically by placing the material in buckets which are linked by a chain or belt at a certain distance which rotates on the pulley so that the bouquet can move vertically. This study uses the tree diagram method to analyse downtime problems by applying the 5 M + 1E technique.*

## 1. INTRODUCTION

In Indonesia, the demand for corn increases yearly in quite high amounts due to demand from the animal feed industry. The following is data on the development of corn production in Indonesia.

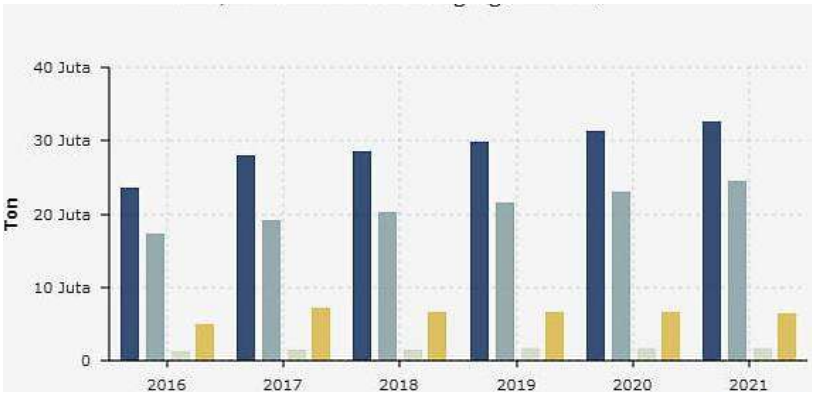


Figure 1. Graph of Corn Production Development Data in Indonesia for 2016-2021



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Based on data from the Ministry of Agriculture, the prognosis for corn needs in 2021 will reach 10.76 million tons, of which 7.04 million tons are allocated to meet the needs of the feed industry and 3.71 million tons for independent livestock. Meanwhile, the prognosis for the availability of dry-shelled corn for January - May 2021 is a deficit, especially in April of 265 thousand tons and in May of 2,896 tons.

Corn production figures in West Nusa Tenggara Province have reached more than 1.6 million tons. It is close to the 2021 production target of 1.7 tons. In West Nusa Tenggara, simultaneous harvesting is also carried out in all districts/cities, except for the city of Mataram and West Lombok district. In September 2021, the corn harvest area in West Nusa Tenggara reached 12,462 hectares, or the equivalent of a production figure of 58,368 tons. Then in October 2021, the area to be harvested is 8,281 hectares or the equivalent of a production of 38,785 tons. Then in November 2021, around 53,926 tons of production.

PT. Santosa Utama Lestari is a manufacturing company that processes agricultural products, namely corn. The corn is processed from wet corn to dry corn which is ready to be sent to Japfa companies in various regions to be processed again into various types of products, be it food or animal feed. At this company, corn is processed using machines and is important in various industrial activities today. One of the machines used is the elevator machine. Lifting equipment, often material transfer equipment, is important in various industrial activities today. Lifting equipment can increase work productivity and efficient time. Based on interviews that researchers got from employees of PT. Santosa Utama Lestari (Moyohilir Unit) that the problem often occurs is downtime on the elevator machine during corn production.

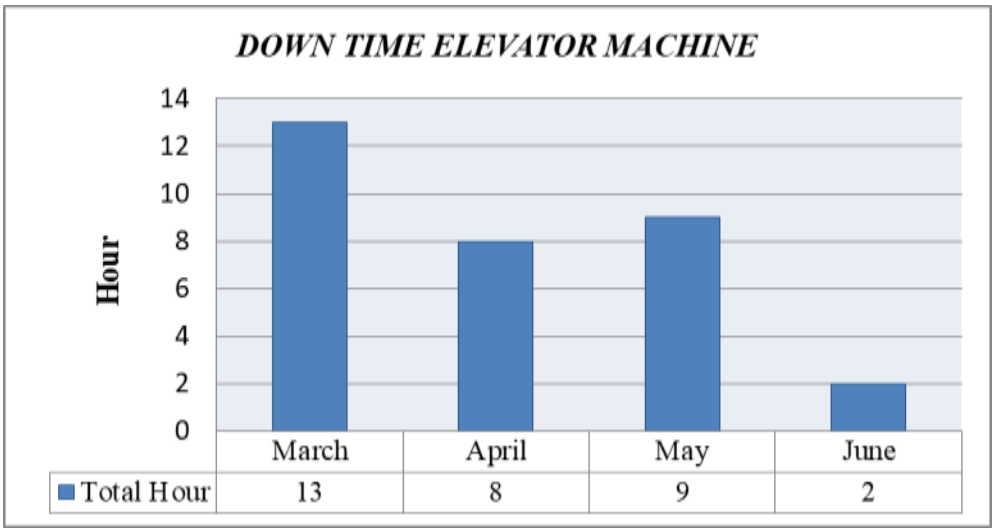


Figure 2. Elevator machine downtime

Because of the downtime, the company suffers a great loss because all that time is wasted, which should be able to produce much production. To overcome this problem, the company needs a method to analyze the causes of the downtime. One of the methods used is a tree diagram, a technique used to identify the root of a problem. Tree diagram analysis is done by forming a more structured mentalist based on causes and effects that are defined by focusing on the problem. The tree diagram method can help describe a tree's structure with roots and branches. Downtime problems, elevator machines, tree diagrams

## 2. METHOD

Good research is carried out through systematically arranged activities. Research activities began with conducting literature studies and field studies. The purpose of conducting a literature study is a study carried out to solve problems using theories obtained from previous research, journals, books, or articles related to research themes and


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field studies. *Field studies* collect information about various variables related to the object used in the research. The results of literature and field studies become an evaluation of the problem identification stage. Problem identification activities aim to identify the causes of existing problems. The results of problem identification become a reference in the data collection stage.

The data collection process is carried out through direct and indirect stages. The data collection results are classified into Data collection by searching and collecting PT. Santosa Utama Lestari and the archives are collected as company documents, such as PT. Santosa Utama Lestari took documentation related to the causes of downtime on the elevator machine directly at the company.

The final stage of the research is in the form of concluding the research results that have been done under the research objectives. Then suggestions are made to provide constructive suggestions to expedite and improve the conditions that occur

## 3. RESULTS AND ANALYSIS

### 3.1. Corn Processing

Based on the results of the researcher's interview with Mikael and Kiky at PT. Santosa Utama Lestari, the corn processing process begins with weighing the corn to determine how much corn is coming in. The corn weighed is poured into the intake machine, then transported by elevator and chain to the temporary storage (wait for silo), according to the classification. After that, from the wait silo, it then flows to the dryer. The corn is processed or dried in the dryer until the water content reaches the dry standard of 14-16%. After being dried, the corn is checked for moisture content and then rushed to the corn shelter or silo. From the corn silo, it is transported using trucks which are then sent to various areas.

### 3.2. Elevator Machine Maintenance System

Treatment system at PT. Santosa is divided into four parts, those are :

1. Periodic maintenance
   *Periodic maintenance* is a maintenance activity carried out periodically within a certain period. For periodic maintenance, PT Santosa still needs to implement periodic maintenance.
2. Predictive maintenance
   Predictive maintenance is activities carried out to anticipate failure before total damage occurs for predictive maintenance PT. Santosa has not been very passive in implementing this system.
3. Treatment after damage occurs
   It is carried out after damage to the equipment occurs, and repair it, spare parts, materials, tools, and labor must be prepared.
4. Corrective maintenance
   Corrective maintenance is maintenance action that is carried out to overcome damage or jams that occur repeatedly. This process is done on equipment likely to be damaged during production.

### 3.3. Causes of Elevator Downtime



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Based on the results of the researcher's interview with Mr. Supriadi and Mr. Mikael and the data obtained from the spare parts admin, Mr. Aditya, it can be seen that the main cause of downtime on the elevator machine at PT. Santosa Utama Lestari is the spouting clogged with dirt, the belt connection is not good, the bucket elevator is broken, the belt is stretched or broken, and the machine maintenance system is lacking, resulting in downtime on the elevator machine.

**Table 1.** Causes of Downtime on Elevator Machines

| Component | Month | | | | Total |
|---|---|---|---|---|---|
| | March | April | May | June | |
| Spouting clogged with dirt | 1 | 1 | 1 | 1 | 4 |
| Poor belt connection | 1 | 1 | 1 | 1 | 4 |
| The bucket elevator is broken | 1 | 1 | 1 | 1 | 4 |
| The elevator belt is stretched/broken | 2 | 2 | 1 | 0 | 5 |
| Less machine maintenance system | 1 | 1 | 1 | 1 | 4 |

3.4. Implementation of Tree Diagrams

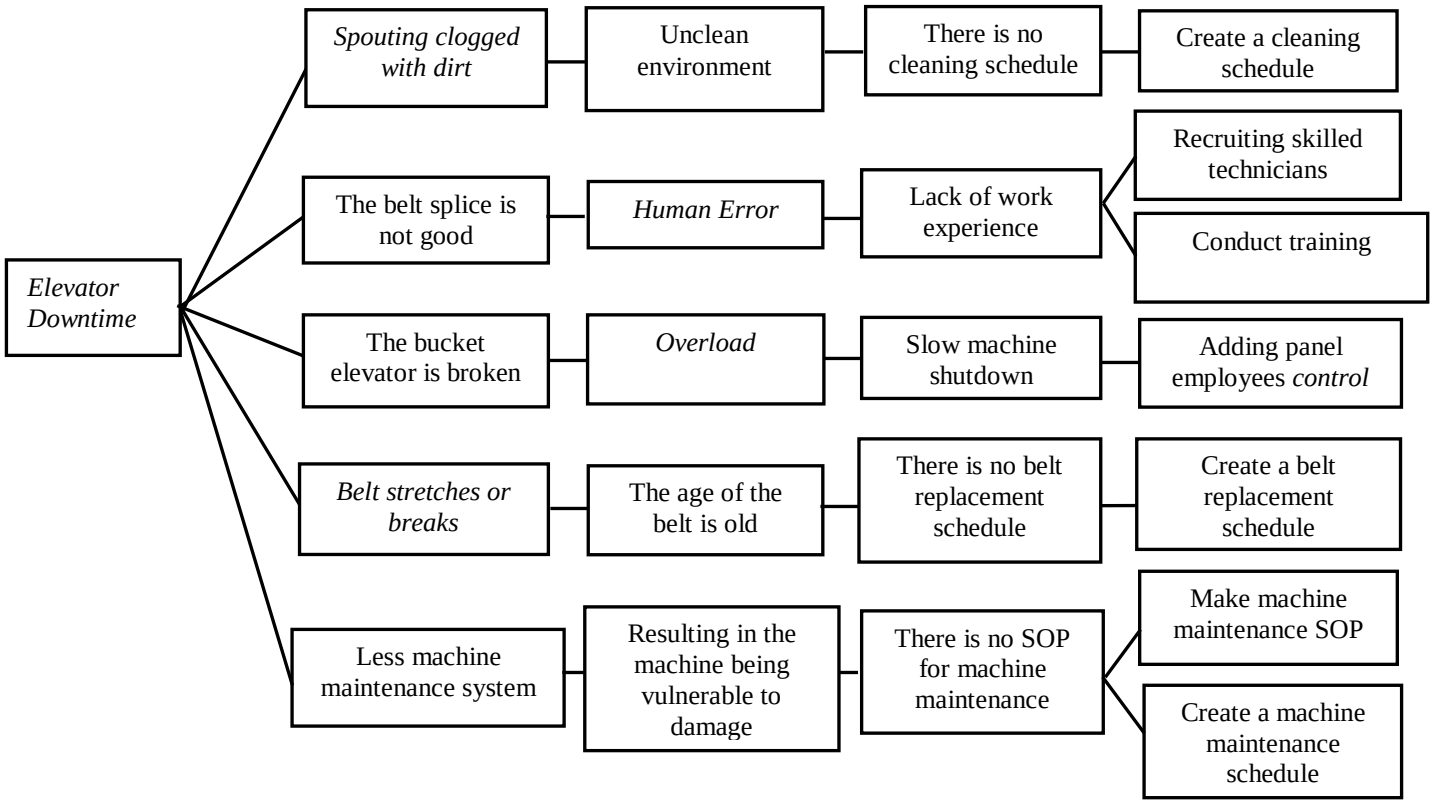


Figure 3. Downtime Elevator Tree Diagram


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Based on the tree diagram in Figure 3, there is a main problem: elevator downtime in the corn processing at PT. Santosa Utama Lestari (SUL). Problems at the first level are the spouting clogged with dirt, the belt connection is not good, the bucket elevator is broken, stretched/broken, and the engine maintenance system is lacking. Problems at the second level are an unsanitary environment, human error, overload, old belt, causing the machine to be prone to damage. The problems at the third level are that there is no cleaning schedule, lack of work experience, the machine is turned off late, no belt replacement schedule, and no machine maintenance schedule.

The first problem is at the first level problem, namely the spouting is clogged with dirt; there is a second level problem, namely the environment is not clean; in this less clean environment, there is a third level problem, namely there is no belt replacement schedule which causes downtime on the elevator machine at PT. Santosa Utama Lestari . The action that can be taken is to make a cleaning schedule.

The second problem is the first level problem, namely, the belt splicing is not good; there is a second level problem, human error; in human error, there is a third level problem, namely lack of work experience. The actions that can be taken are conducting training and recruiting skilled technicians.

The third problem is at the first level problem, namely the broken bucket elevator; there is a second level problem, namely overload, and at overload, there is a third level problem, namely the engine is slow to turn off. The actions that can be taken are to add control panel employees.

The fourth problem is the first level problem, namely the belt stretches or breaks, there is a second level problem, namely the age of the belt is old, and when the belt is old, there is a third level problem, namely there is no belt replacement schedule. The action that can be taken is to make a belt replacement schedule.

The fifth problem on the first level problem is that the engine maintenance system is lacking; there is a second level problem which results in the engine being prone to damage, and on machines prone to damage, there is a third level problem, namely there is no SOP for engine maintenance. The actions that can be taken are making machine maintenance SOPs and making machine maintenance schedules.

Based on the problems that occur, the main causes of elevator machine downtime at PT. Santosa Utama Lestari (SUL), some actions can be taken to reduce or prevent downtime on the elevator machine. The actions taken are making a cleaning schedule, conducting training, recruiting skilled technicians, adding control panel employees, making belt replacement schedules, making maintenance SOPs, and making machine maintenance schedules.

## 4. CONCLUSION

The final result of the analysis and discussion is applying a tree diagram. The factors that cause downtime on the elevator machine at PT. Santosa Utama Lestari (SUL) from the results of analysis using a tree diagram, namely spouting clogged with dirt, unclean environment, no cleaning schedule, poor belt splicing, human error, lack of work experience, broken bucket elevator, overload, the slow engine is turned off, the belt stretches/breaks, the age of the belt is old, there is no belt replacement schedule, the engine maintenance system is lacking, resulting in the engine being prone to damage, there is no maintenance SOP.

## 5. ACKNOWLEDGEMENTS

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## 6. DECLARATION OF COMPETING INTEREST

We declare that we have no conflict of interest.



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## 7. REFERENCES

Ahmadi Noor. (2017). Analisis Pemeliharaan Mesin Blowmould Dengan Metode RCM Di PT. CCAI. *Jurnal Optimasi Sistem Industri*. Jakarta Selatan. Universitas Pancasila

Fawas Novianda. (2021). *Peran Penyuluh Pertanian terhadap Tingkat Produksi Usahatani Jagung.* Departemen Sosial Ekonomi Pertanian. Sumedang. Universitas Padjadjaran.

Ilyas Rory. (2018). *Konstruksi Dan Manufaktur Perancangan Alat Elevator Pada Pabrik Kelapa Sawit.* Universitas Muhammadiyah. Sumatera Utara.

Mustaghfiroh. (2020). Konsep Merdeka Belajar Perspektif Aliran Progresivisme Jhon Dewey. *Jurnal Study Guru dan Pembelajaran*. 3(1). 141-147

Pangaribuan Omry. (2022). Penenentuan Frekwensi Pemeriksaan Yang Optimal Untuk Meminimumkan Downtime Pada Mesin Tarik Pt.Growth Sumatra Industry Medan. *Jurnal Sains dan Teknilogi ISTP*. Institut Sains Dan Teknologi. Medan.

Pasta Ikhwana. (2015). *Tanggap Pertumbuhan Dan Hasil Tanaman Jagung Manis (Zea Mays L. Saccharata) Pada Aplikasi Berbagai Pupuk Organik.* Universitas Tadulako. Palu.

Rahmania Tiara. (2016). Perbaikan Sistem Perawatan Mesin Pada PT Xyz. *Jurnal Sistem Teknik Industri*. Universitas Sumatera Utara. Medan.

Sudana Oka. (2017). *Implementasi Diagram Tree pada Rancang Bangun Sistem Informasi Bebayuhan Oton Berbasis Web*. Bali. Universitas Udayana

Utami Nadia. (2021). *Analisis Kebutuhan Dan Manajemen Pemeliharaan Elevator Gedung Kementrian Dalam Negeri Republik Indonesia.* Jawa Barat. Universitas Gunadarma

Zakariya Yuza. (2020). Pengendalian Mutu Produk Air Minum Kemasan Menggunakan New Seven Tools (Studi Kasus di PT. DEA). *Jurnal Sains Dan Teknologi. Madura*. Universitas Trunojoyo Madura.


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