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Design and Construction of Magnetic Support Construction Separator on Track V 33 BC-5 at Greenzone 2

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Abstract: The process of shredding and sorting waste in the Pre Processing method is one of PT Solusi Bangun Indonesia's contributions in overcoming waste and pollution problems. The waste will be shredded into certain sizes and put into the cement kiln. The processing place is called a green zone. In this process, sometimes the material transport contains impurities in the form of metal and the like. This distribution has the potential to cause foreign material to be carried because there is no sorting of waste content. Belt conveyors and dynamic disc screens are often damaged by the metal material. This problem can be overcome with a magnetic separator to separate foreign metals from waste that is channeled using a belt conveyor. The magnetic separator provides protection for the dynamic disc screen and conveyor operating process from foreign material so that the potential for wear on the dynamic disc screen and torn belt conveyor can be avoided. The installation of the magnetic separator position uses a construction based on the optimal position. This study discusses the design and construction of the green zone belt conveyor magnetic separator installation. The construction installation for the magnetic separator aims to facilitate access to maintenance and cleaning, also provide access to dispose of foreign materials and protect the material transport system in the green zone. Before redesign magnetic sparator, the company spent Rp. 389,000,000 maintenance cost from November 2023 to February2024 period. After redesign, it's can reducing maintenance and repair costs during the period March 2024 to July 2024 with no maintenance related to metal separation.

Keywords: AFR; Belt Conveyor; Waste Processing

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1. Introduction

Area *greenzone* 2 merupakan area pencacahan material limbah Solid dan oil sludge dari berbagai macam material termasuk material yang mengandung B3 Seperti sampah rumah tangga, bekas cat, makanan, kosmetik dan sebagainya. Material ini akan dicacah menggunakan mesin yang Bernama shredder dengan tipe MJ 4000 yang kemudian hasil pencacahan akan di transportasikan oleh beberapa belt conveyor dan akan disaring menggunakan *dynamic disc sreen.*

In the transportation process, there is a Magnetic separator that will separate metal material from waste material but it cannot function properly so that the separation of metal material is not optimal.

Figure 1. Dynamic disc screen is damaged

The result of this suboptimal metal separation causes some equipment to be damaged quickly, especially in the dynamic screen section. The dynamic disc screen will be quickly eroded by hard metal material that will rub against the disc screen. The price of a disc screen per set is Rp. 35,000,000.00 which will cost a lot of money if the disc screen is often damaged. Based on this background, a design and construction of a magnetic separator support is needed in the greenzone 2 area.

2. Materials and Experiment Methods

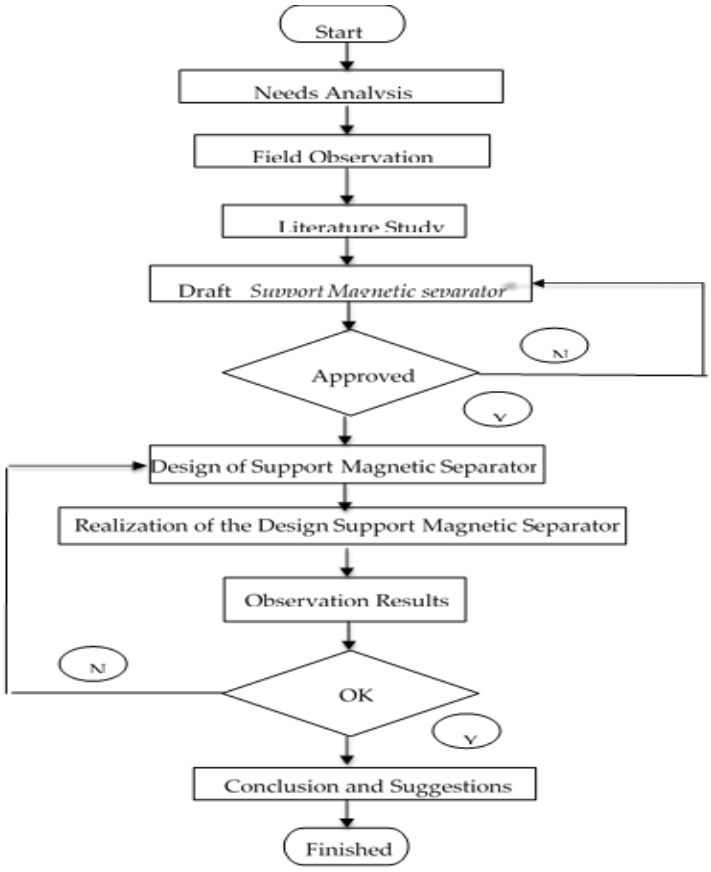

Figure 2. Flow Diagram

Figure 2 is a flow diagram of the author in conducting final assignment research systematically and scientifically, this aims to achieve the goal of designing and building a functional Construction Support according to the objectives.

Final Assignment Observation

At this stage, the author conducted observation activities at several locations where the magnetic separator was installed directly and collected data and information through measurements and checks on objects related to the manufacture of the tool, namely the composition of the construction structure and the availability of materials in the warehouse. The data and information obtained include:

1. Location where construction is built
2. Materials used for construction
3. Technical data related to manpower and tools

Literature Study

At this stage, the author collects and searches for references related to the final assignment from books, research journals, catalogs and internet access, as well as studying information related to this final assignment such as concepts for calculating the machine elements used, products that already have patents, load calculations and designs of the magnetic separator support components to be made, namely the type of material, welding and fabrication.

Tool Design

At this stage, the author applies the basic theories that have been there to be used in the calculation process based on user needs and the results of the concept selection. The design carried out on the magnetic separator support components, namely:

1. Design of magnetic separator support
2. Construction material planning
3. Planning connections between materials

3. Results and Discussion

The following is a root cause failure analysis using the fishbone method:

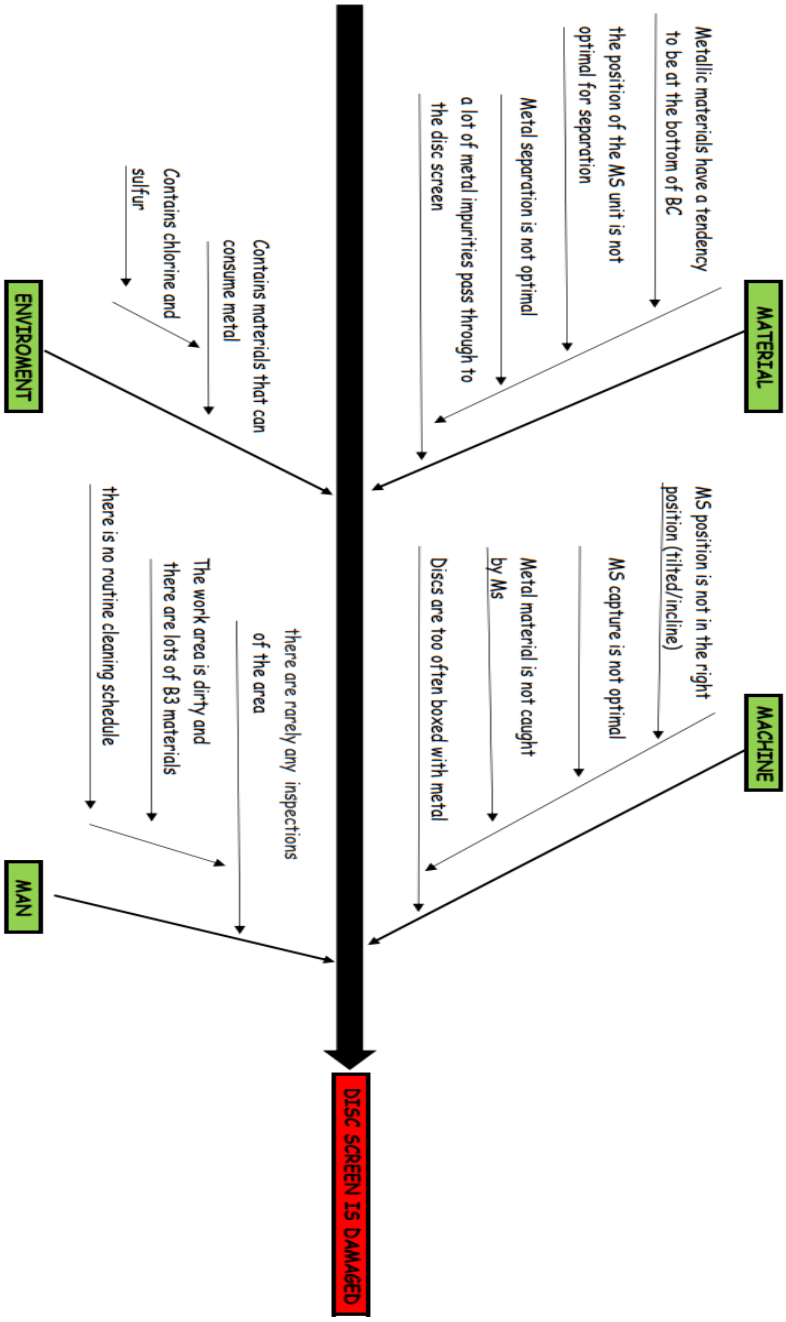

Figure 3. Root Cause Failure Analysis

Based on Figure 3 , it can be divided and described from each existing indicator such as machine, material, and environment.

3.1 Root Cause Analysis Machine

The following is a description of the Root Cause Analysis Machine;

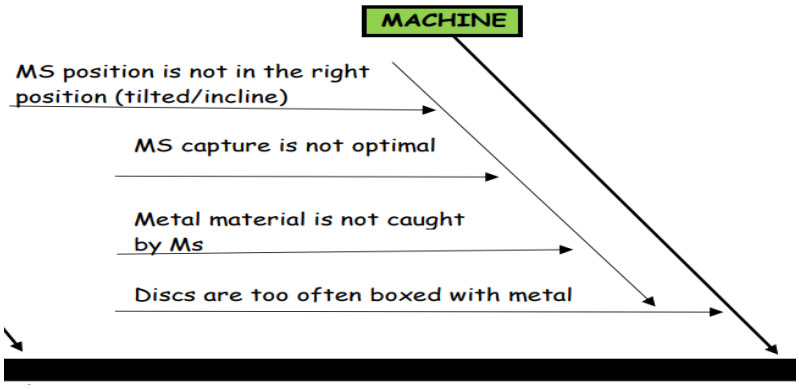

Figure 4. Root Cause Analysis Machine

Based on the analysis of the fishbone diagram from the machine side. Disc material often hits metal material due to suboptimal metal material capture. This is because the position of the MS unit is on the incline conveyor so that the Belt on the MS unit is often tilted and the material is not lifted optimally.

3.2 Root Cause Analysis Environment

Based on the fishbone diagram, it can be concluded that AF material contains the most Sulfur and Chlorine. So it can easily corrode uncoated metal materials. Figure 5 shows the sulfur and chlorine content contained in the material to be processed in greenzone 2.

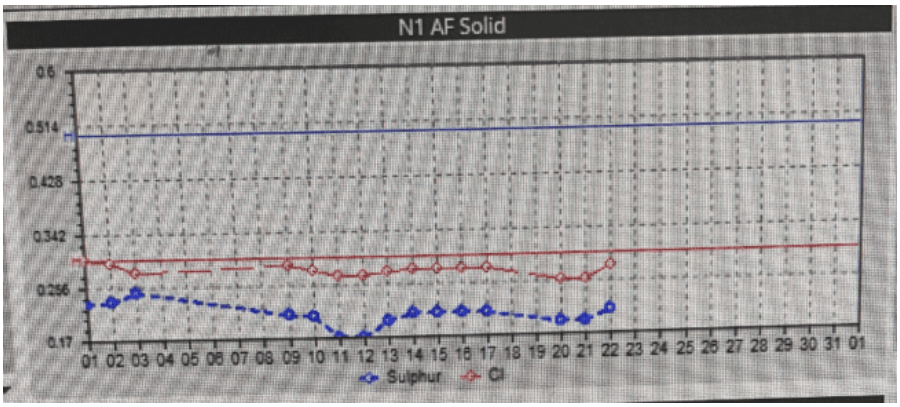

Figure 5. Sulfur and Chlorine content in greenzone 2 products

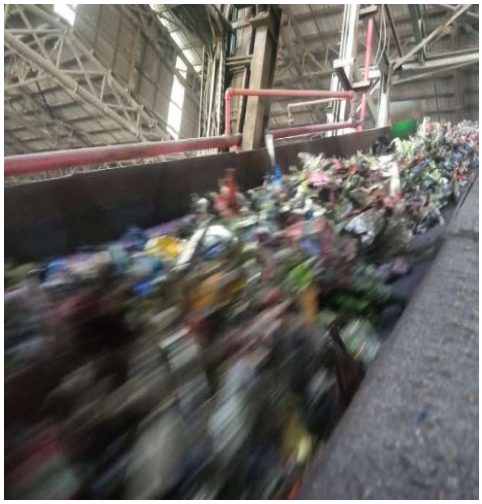

Figure 6. Sulfur and Chlorine content in greenzone 2 products

3.3 Root Cause Analysis material

Based on the analysis using the fishbone diagram, the biggest influence on disc screen damage is the amount of metal material stuck in the disc screen.

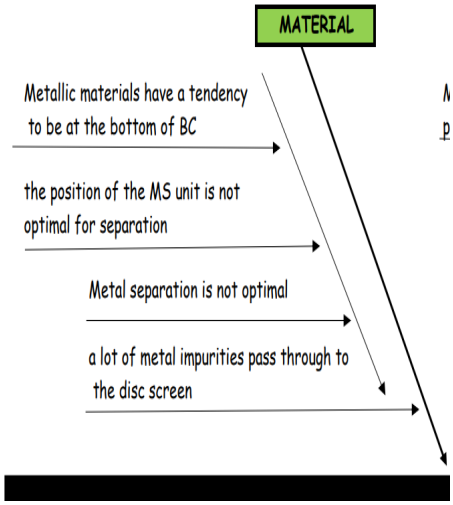

Figure 7. Root Cause Analysis Material

In addition, based on direct conditions in the field, the position of the old Magnetic separator in the inclined position also affects the capture of metal materials. This is because the metal material is covered by clumps of garbage.

3.4 Root Cause Analysis Man

The following is an explanation of Root Cause Analysis Man

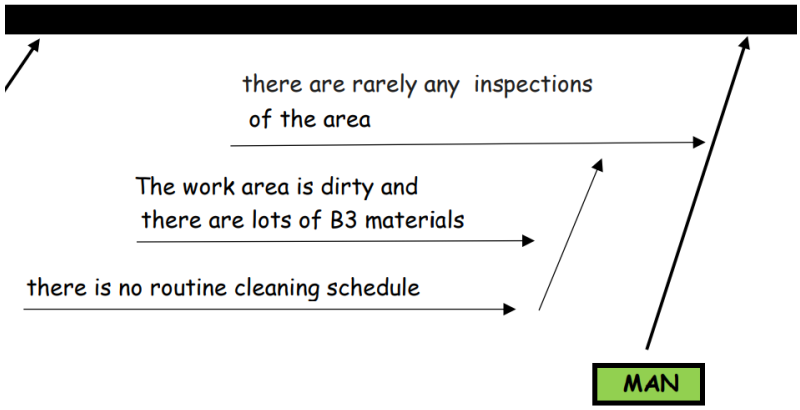

Figure 8. Root cause analysis man

Based on field observations, it was found that there was no cleaning schedule or clean up schedule in the disc screen area routinely. This happened because of the large amount of garbage covering the area and the pungent odor and B3 materials that could be harmful to the skin so that special PPE was needed during cleaning.

Therefore, without a regular cleaning schedule, debris stuck in the disc screen will continue to erode the surface between the discs.

4. Conclusions

Based on the calculation of maintenance costs related to the problem of metal materials that have passed through to the equipment period from November 2023 to February 2024 , funds amounting to Rp. 389,000,000 have been spent.

However, after the installation of the new MS unit with the design and calculation of the method. In the period from February 2024 to July 27, 2024, there have been no reports or repairs caused by magnetic separation problems. So that the design, planning, and construction methods can be said to save maintenance costs on greenzone 2 operations.

From the results of the design and construction project support Magnetic Separator Unit Construction the following conclusions were obtained:

The magnetic separator support construction on the V33-BC 5 line has been installed with the following specifications.

- All support materials for the new MS unit use structural steel H beam 150 x 150
- The connection between structural steel uses RD 7018 welding connection
- All bolt connections are standardized using M16 bolts.

With the installation of the Support Magnetic Separator Unit on the V33-BC 5 line in a new position with the concept, design, and planning as well as its realization, it has succeeded in reducing maintenance and repair costs during the period March 2024 to July 2024 with no maintenance related to metal separation.

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