Characterization of electric energy on motor to the load and conveyor’s slope

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Abstract. Conveyor widely used in the industrial world such factories in which have a function to move goods. The disadvantage of electric energy on the conveyor can be caused by the load, the motor, and time of conveyor operation. This research is focused on energy efficiency of electric motors on the conveyor with doing characterization of electric energy to the load on the motor and conveyor’s slope. This research is conducted in order can use energy electric motors on conveyor exactly as needed. Conveyor is made automatic using a sensor LDR (Light Dependent Resistor) and laser, in order to save electricity. The method is conducted by transporting the load with the variation of the angle slope, there are 0°, 20°, 30°, and 40°. The result of the research Obtained roommates prototype automatic conveyor equipped with load mass 2kg, 4kg, 6kg, 8kg, 10kg, and 12kg.

1. Introduction

Electric energy is a basic requirement the man needs to live a daily life. The entire apparatus at this time, almost all of its electricity use. Ranging from household appliances to industrial activities. In industrial activities, almost all of the tools used for the production of electricity use. Electricity used in industrial activities has been on a large scale. Indonesia which is the country's largest manufacturing industry to 4 in the world [1]. Must pay attention to the needs of the electric energy needed. The use of electricity in the world of industry is dominated by the use of an electric motor by 70% [2], because the tools in the industry much to use electric motor. One of the tools in the industry which uses an electric motor is the conveyor. Conveyor is a tool for transporting materials from one place to another. Conveyor is widely used in industry, namely in factories that have the function to move the goods. Electric energy losses because to factors including load conveyor, conveyor motors and times of operation. Thus, it will be carried out research which focused on energy efficiency of electric motor characterization conveyor with electric energy to the load and tilt motors conveyor. The study was conducted in order to use the electric energy in the right conveyor motors as needed. Conveyor made automatic by using sensor LDR (Light Dependent Resistor) and laser, in order to save electricity.

The conveyor is driven through a DC motor and the conveyor motion is controlled automatically [3] and programmed [4] via a microcontroller. The strength of a DC motor is greatly influenced by the current used [5]. Program speed uploading conveyors via computer [6,7] based on input signals from optical sensors [8,9].
2. Methods
The research method is experimental method. Methods for designing prototype experiments carried automatic conveyor to analyse the electric energy of the motor. The workings of the prototype automatic conveyor explained in the block diagram in figure 1.

![Block Diagram Prototype Automatic Conveyor](image1)

**Figure 1.** Block Diagram Prototype Automatic Conveyor.

While the process of collecting data on the characterization of electric energy the motor made in accordance with the schema in figure 2.

![Characterization of Electric Energy Schema in Prototype Automatic Conveyor](image2)

**Figure 2.** Characterization of Electric Energy Schema in Prototype Automatic Conveyor.

3. Results and Discussion
Experiment characteristics of electric energy motor at conveyor done accordance with the figure 3.

![Experiment Characteristics Electric Energy of Motor on The Conveyor in Flat State](image3)

**Figure 3.** Experiment Characteristics Electric Energy of Motor on The Conveyor in Flat State ($\theta = 0^\circ$)
3.1. Characteristics Electric Energy of DC Motor to the Load Mass on Conveyor Slope $\theta = 0^\circ$

The relationship electric energy DC motor to the load mass being transported on a conveyor in a flat state ($\theta = 0^\circ$), then be made to the graph $W = f(m)$ as in figure 5.

![Figure 5](image)

Figure 5. The Graph Electric energy DC motors to the Load Mass.

3.2. Characteristics Electric Energy of DC Motor to the Mass on Conveyor slope $\theta = 20^\circ$

The relationship electric energy DC motor to the load mass being transported on a conveyor in slope $\theta = 20^\circ$, then be made to the graph $W = f(m)$ as in figure 6.

![Figure 6](image)

Figure 6. The Graph Electric Energy of Motor DC to the Load Mass.
3.3. Characteristics Electric Energy of DC Motor to the Load Mass on Conveyor Slope $\theta = 30^\circ$

The relationship electric energy DC motor to the load mass on conveyor with slope $\theta = 30^\circ$ is expressed in the graph at figure 7.

![Figure 7](image)

**Figure 7.** Graph of Electric Energy Motor to The Load Mass.

3.4. Characteristics Electric Energy of Motor DC to Load Mass on Conveyor Slope $\theta = 40^\circ$

The relationship electric energy of DC motor to the load mass on the conveyor slope $\theta = 40^\circ$ is expressed in the table 1.

| No. | Mass (kg) | Current (A) | t (s) | E (joules) |
|-----|-----------|-------------|-------|------------|
| 1.  | 1         | 2.08        | 9.29  | 174.04     |
| 2.  | 2         | 2.24        | 9.66  | 194.71     |

**Table 1.** Data Relationships Mass, Flow, Time with electric energy Motor DC on Conveyor.

3.5. Characteristic Electric Energy of Conveyor’s Slope $\theta$, $20^\circ$, $30^\circ$, $40^\circ$

The relationship of electric energy to the slope angle of the conveyor is expressed on graph in the figure 8.

![Figure 8](image)

**Figure 8.** Graph of Electric Energy DC Motor to The Conveyor Slope.
4. Conclusion

Characteristics electric energy DC motors on conveyor with slope and with the mass of the load being transported is a positive linear means that the greater the mass load of the electric energy required increasingly large motors. 0°, 20°, 30°40°. Characteristics of the electric energy to the DC motor and the tilt angle of the conveyor is a positive linear, meaning that the rising surface of the conveyor (the larger), then the electric energy required increasingly large motors. 0°, 20°, 30°40°. Installation of closely spaced belt so as not to cause deflection on the belt, which is between the pulley-pulley.

5. References

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