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Kinematic Analysis of Package Convey Mechanism

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Abstract - Industry uses a conveyor as a mechanism to transport packages from one place to another. This mechanism includes strong belts, pulleys and heavy motors to rotate the pulley to move the conveyor. As an alternative to this conveyor type, more simple and comfortable machine using four bar mechanism can be used. These packages convey machine helps in transfer of packages smoothly by use of four bars with a simple arrangement. The degree of freedom of the four bar mechanism is unity, due to which it gives constrained motion. The rotary motion of the crank is transferred to the follower by using connecting rod and is converted to the same rotary motion. This machine requires an electric motor to provide input to the system.
Keywords - Mechanism, Package conveys Machine, four bar mechanism, degree of freedom, and constrained motion.

I. INTRODUCTION

In the industrial environment the packages are transfer by the conveyor or an operator, who picks up the packages from one place to another. In the conveyor system which is continuous and there is no time delay in shifting the packages which result in increasing of work load like stamping, labelling etc. And these work, which is to be done after the shifting of packages which increases the complexity in industries and also increases the time delay in production line. And conveyor system requires programming, which is costly. So these project is to design and analysis of package convey mechanism which provides a time delay in shifting of packages and it also uses in the ice cream industry in production line for topping purpose. In these project the simple crank rocker mechanism is used which consume less power. It is also provide less hand movement, less work handling, less human effort etc. this project can also used where different type of operations like punching, pressing, stamping , labelling, testing etc. are required.

II. LITRATURE REVIEW

A machine is a combination of rigid or resistant bodies, formed and connected so that they move with definite relative motions and transmit force from the source of power to the resistance to be overcome. A machine has two functions: transmitting definite relative motion and transmitting force. These functions require strength and rigidity to transmit the forces.
The term mechanism is applied to the combination of geometrical bodies which constitute a machine or part of a machine.
A mechanism may therefore be defined as a combination of rigid or resistant bodies, formed and connected so that they move with definite relative motions with respect to one another **(Ham et al. 58)[1].** Although a truly rigid body does not exist, many engineering components are rigid because their deformations and distortions are negligible in comparison with their relative movements.
In a four bar mechanism the link on which input motion is applied is known as driver. The output motion link is follower and the middle link connecting these two links is coupler link. The fourth links grounded. A four bar mechanism has 1 degree of freedom .If the input link can rotate fully it is called as crank. A link that can't rotate fully is known as rocker.
Grashof's Theorem - If S is the smallest link, L is the largest link and P, Q are the intermediate links, then there will be at least one link which will be able to revolve/rotate if [S+ L< P+Q]. The four bar mechanisms that satisfy these criteria are known as grashofian mechanism.
The word mechanism has many meanings. In kinematics, a mechanism is a means of transmitting, controlling, or constraining relative movement **(Hunt 78)[2].** Movements which are electrically, magnetically, pneumatically operated are excluded from the concept of mechanism. The central theme for mechanisms is rigid bodies connected together by joints.
The combination of links and pairs without a fixed link is not a mechanism but a kinematic chain. In kinematic analysis, a particular given mechanism is investigated based on the mechanism geometry plus other known characteristics (such as input angular velocity, angular acceleration, etc.). Kinematic synthesis, on the other hand, is the process of designing a mechanism to accomplish a desired task. Here, both choosing the types as well as the dimensions of the new mechanism can be part of kinematic synthesis**.(Sandor & Erdman 84)[8].**

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III. DESIGN AND FABRICATION METHODOLOGY

The design and fabrication methodology of the project has been shown in the figure 1 below.

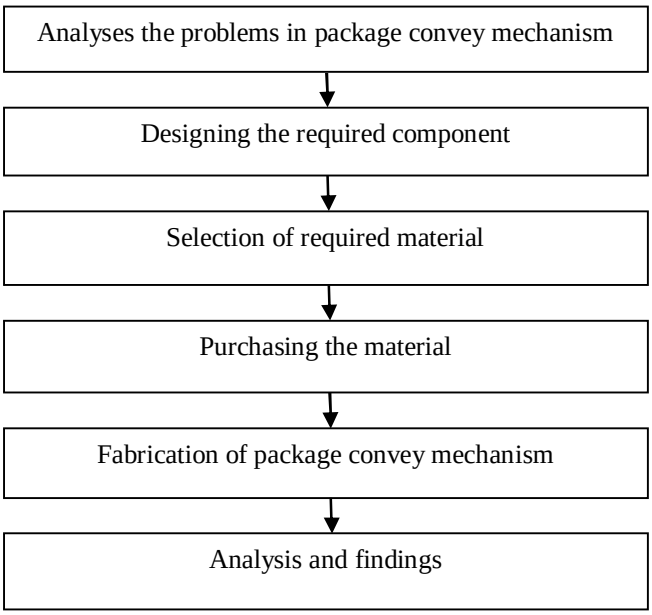

Figure: 1 Design and fabrication methodology

A. Analyses the problems in package convey mechanism – Firstly all the team members analyse the problem related to fabrication of the mechanism.

B. Designing the required component – After which, team members prepare the drawing of required components for fabrication. Each member of the mechanism has been designed for the required load to be transferred.

C. Selection of required material – For fabrication, the group has used hylem board for manufacturing of links, connecting rod and crank. And also uses a DC motor for power supply.

D. Purchasing the material – The team members purchased all the required materials from the market like hylem board, MS pipes, screws, nuts etc.

E. Fabrication of box shifting mechanism – Firstly group members cut the links, connecting rod and crank from the hylem board and perform the specific operations like drilling, cutting welding etc. Then join all the links through screws and nuts and weld the structure. Then motor is fitted to the structure.

F. Analysis and findings – For the different weight of the packages, different readings are taken by the group members. After the calculation group members making a table of results as shown below.

IV. PACKAGE CONVEY MECHANISM

The packages convey mechanism is shown in figure 2. It consists of several members including Frame (remains static throughout the working) it provides required rigidness. The crank received input motion from an electric motor . Package conveyer member receives motion through coupler.

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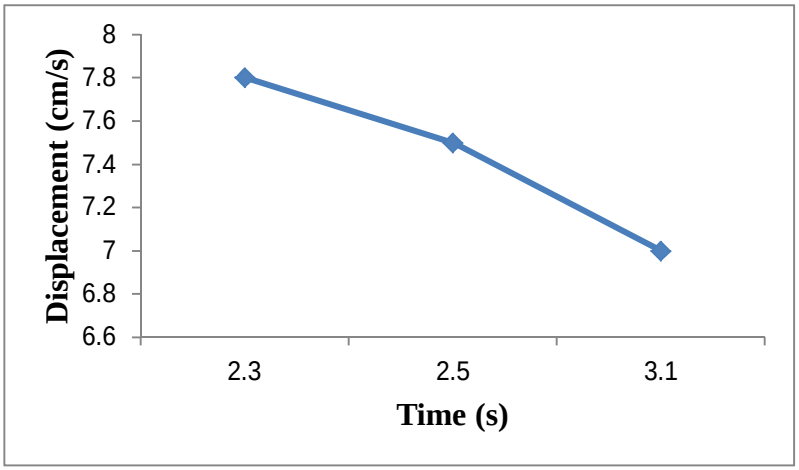
Figure: 2 Package Convey Mechanism

V. RESULT & DISCUSSION

Sr. no.	Package Weight	Link Weight	Total Weight	Rpm	Torque (N-m)	Displacement (Cm/s)	Time (S)	Force (N)	Velocity (Cm/S)	Acceleration (Cm/S^2)
1.	100gm	335gm	435gm	28	4.092	7.8	2.3	40.92	3.391	1.474
2.	150gm	335gm	485gm	26	4.407	7.5	2.5	44.07	3	1.2
3.	200gm	335gm	535gm	21	5.456	7.0	3.1	54.56	2.25	0.728

Table 1 Readings obtained



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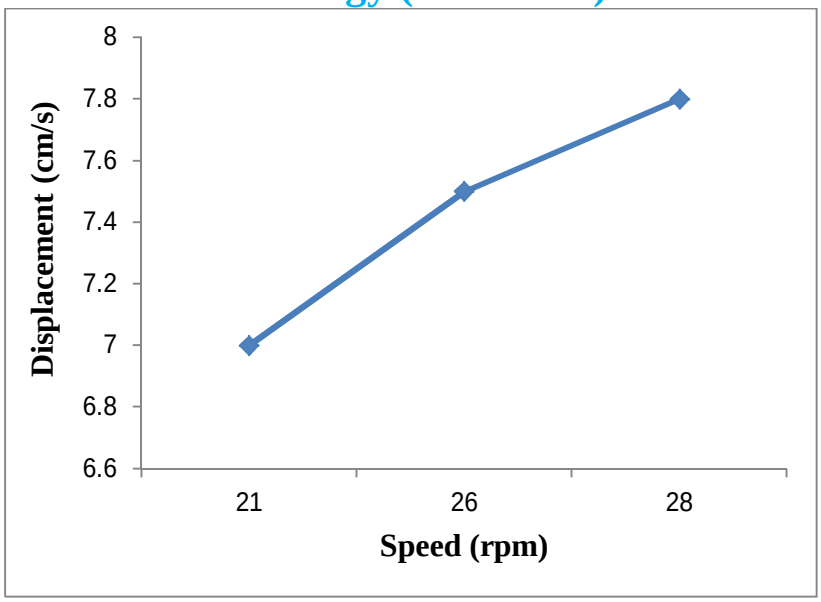

Figure: 3 Graphs

VI. CONCLUSION

This project is the result of implementation of basic mechanical knowledge and designing skills for designing and fabrication. The designed Package Convey Mechanism is working satisfactorily. It is very simple in design and construction. The need of power is also very less. The operating range can be easility increased/decreased. The package convey mechanism plays a major role in industries, the process of transporting or shifting products from one place to another was to be maintained by conveyors only. This mechanism can be a better solution for different industries This project is just successfully altered the conventional system with a package convey mechanism using the kinematics links and a motor.

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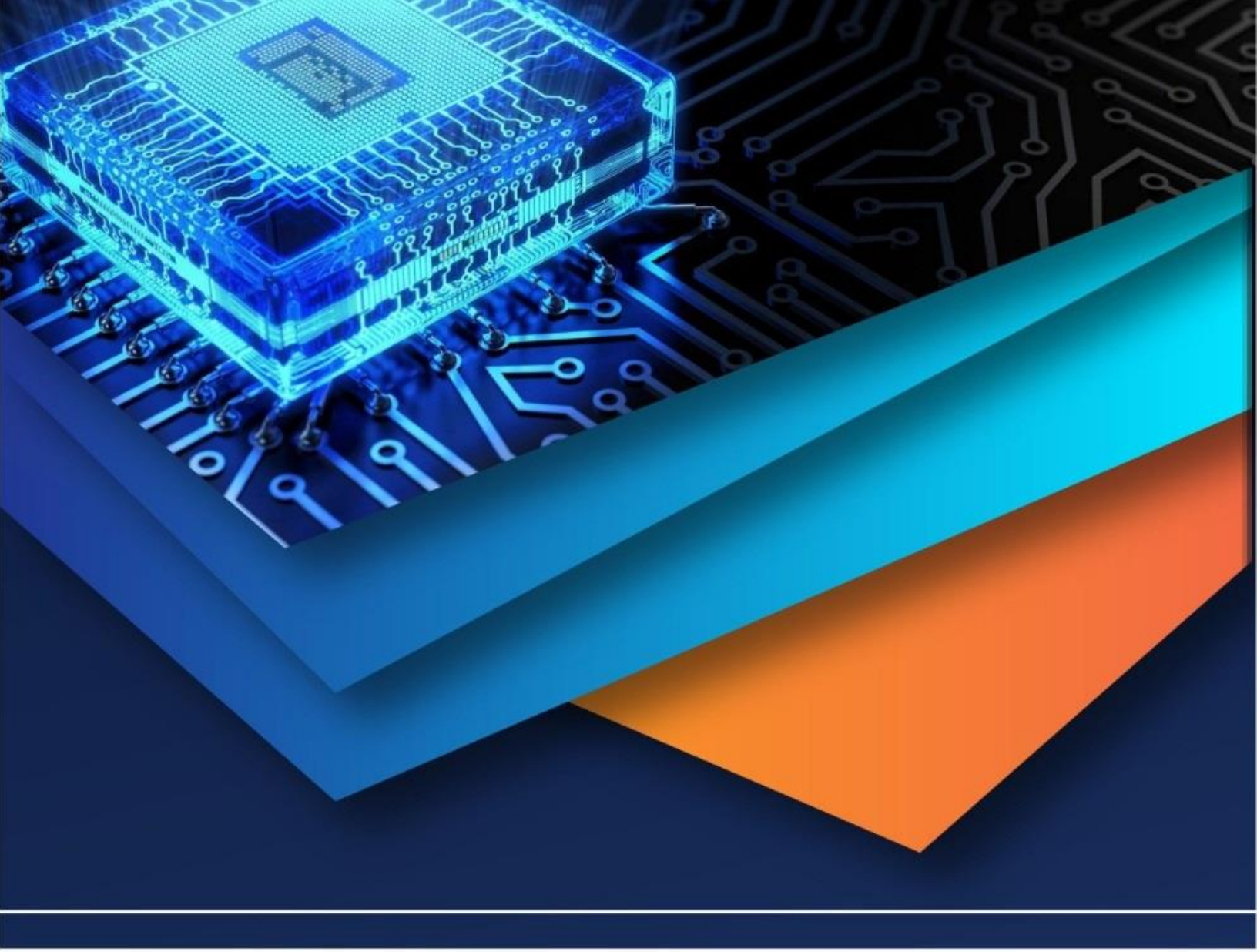

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