

HIGH PERFORMANCE ON VACUUM GLASS LIFTER USING SUCKER CUP ARRANGEMENT

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Abstract — Glass handling task in glass manufacturing industry is very important and risky one. At present this task carried out with the help of glass lifter (vacuum operated pump with attached to the overhead crane). Currently this operation required high pressure vacuum pump. Which have high pressure ranges and aim of this paper is to use simple sucker cup instead of vacuum pump and trolley arrangement instead of heavy crane. We all know that current scenario is very automatic everyone wants to increase the efficiency and reduce the cost as well; this arrangement can helpful for increase the efficiency with less cost. We will improve the operation of glass handling and reduce the overall cost by analysis and design of vacuum glass lifter using sucker cup arrangement.

Keywords-Sucker cup, Trolley frame, Wheels, Gripper

I. INTRODUCTION

Expeditious growth of industrialization is nowadays needed to meet the goals of every industry. Faster production, more profit with customer's satisfaction. Every production plant take care of their lead time, production rate, optimal cost and most importantly quality. In past, many researchers have done research to make glass handling task in glass manufacturing industry. In this paper, the study is an inventive way for handling of glass in glass manufacturing industry. Particularly, flexibility of operation with automation in this area attracts high attention of public interest. Vacuum pump i.e. sucking effect for picking glass can be used by most of the glass manufacturing industry. Vacuum gripper is very essential part of the vacuum glass lifter. As existing system like vacuum pump and overhead crane is old methods and the risk is associated with it. Here, include various trials are applied which can help to improve the operation Sucker cup instead of vacuum can change the handling of glass. And for flexible movement of the glass trolley arrangement is provide which results better movement. Two major considerations in the vacuum glass lifter is not only improve the operation but also reduce the handling cost of the glass. Nowadays newer automation is available which give better exposure to operation of glass handling in this glass manufacturing field.

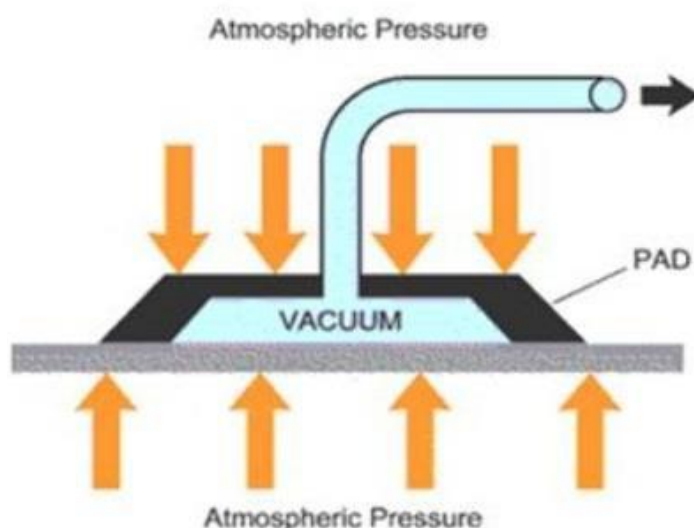


Figure 1 Working principle of Sucker cup

LITERATURE REVIEW

Tudor Catalin Apostolescu, Nicolae Alexandrescu, Constantin Udrea and Lucian Bogatu has done research in area of vacuum attachment cups for a robot with vertical displacement. This paper reports a part of the results of basic characteristics of vacuum suction cups, representing the adhesion solution for a mobile robot with vertical displacement. The cup behaviour during loading with an external force in normal direction, applied on glass, polished aluminium and textolite, was studied. The force determinations were performed and compared for dry and respectively wet conditions. These results, combined with the ones referring to loading with a lateral force and combined (normal and lateral) forces, are useful for modelling and simulating the robot legs positioning during its sustaining on vertical surfaces[1].

Fr. Novotny, M. Horak has analyses computer modeling of suction cups used for window cleaning robot and automatic handling of glass sheets. The paper analyzes the conventional force process for dimensioning of the gripping element with combined loading by axial and radial forces. Owing to necessity to define deformation and mechanical loading capacity, the computer simulation of the suction cup deformation behaviour was carried out. The verified computer model was applied to describe the course of the suction cup deformation cycle during loading when simple axial, radial and combined stresses were used. FEM outputs were presented by deformations of the suction cup profile at contact point chosen and allow contractual values of deformation safety to be defined. Using modelling, it was found that especially radial loading of suction cups is hazardous. Mainly their combined stress (radial and axial loadings simultaneously) changes the contact surface geometry (the contact profile shape) due to friction and material properties of elastomer and degree of vacuum. Based on the analysis performed, it is necessary to determinate the safety level using deformation behaviour theory as it applies to suction cup loading in practice. In the case dominant radial loading of suction cups, it is necessary the standard safety level value to increase by approximately 60% [2].

Prof. S.S.Bhansali, Mayur R. Puri, Ajay U. Ingole, Sandeep Kaware has done the review on wall climbing robot. In Present day the construction and maintainance of smart buildings with architecture of frontages of glass wall attract the service of washing-cleaning and periodically inspection of them. Washing, cleaning and regular inspection of these buildings comes at a very high cost and so these types of smart buildings are increasing so the scope for the wall climbing and cleaning robot is increasing due to its low power consumption and its low manufacturing cost and high operational efficiency. But it's basic aim is to substitute the human operator from hard, Dangerous and high risk's working. In future, range of services by this type of robots are extended when needed [3].

A. K. Jaiswal and B. Kumar has done study on vacuum gripper- an important material handling tool. In this paper, vacuum gripper in industrial robot applications has been discussed exclusively with gripping of different variety of materials/parts comparing with other various types of vacuum grippers. The end effectors must typically be designed for the specific application. By comparison to the human hand, a robot's vacuum gripper is very limited in terms of its mechanical complexity, practical utility and general applications. Vacuum gripper is fruitful for the, objects of very different shape, weight, and fragility can be gripped, and multiple objects can be gripped at once while maintaining their relative distance and orientation. This diversity of Abilities may make the gripper well suited for use in unstructured domains for variable industrial tasks, such as food handling and others. The gripper's airtight construction also provides the potential for use in wet or volatile environments and permits easy cleaning. The prime interest of this paper is to explore the utilities and advantages of vacuum gripper with its applications for different product type manufacturing robot application's industries. So, the industry performance can be increased and which would decrease the cost of the product effectively. Optimal performance of a vacuum gripper is maintained by resetting the gripper to a neutral state between gripping tasks [4].

Sourav Das, (CAE Analyst) have done research on design and weight optimization of aluminum alloy wheel. In the optimization of wheel rim, the wheel structure and its features are divided into two parts, namely design space and non design space. The non design space is the standard design and cannot be modified. The design space is the region for optimizing the weight and shape of the arms. The wheel design space is optimized in order to withstand the existing load of the vehicle with the factor of safety with a least quantity of material and manufacturing cost and losses. The five arm structure is the optimal output of the solver to withstand stresses. Conclusions traced out during the optimization and evaluating the life of the wheel are as follows:

- The weight of rim is optimized from 26 Kg to 12.15 Kg using topology method.
- The shape of the arm's cross section is made easier to manufacture and to distribute the stress induced in the rim.
- The optimized design is analyzed to withstand all the loading conditions acting upon it, such as:
- Radial load used is 8976 N and the maximum stress induced in the wheel is 94 MPa which is less than the yield stress of the material suggested i.e., 185MPa
- Lateral load used is 4044 N and the maximum stress induced in the wheel is 64 MPa which is less than the yield stress of the material i.e., 185MPa
- Bending load used is 4488 N and the maximum stress induced in the wheel is 35 MPa which is less than the yield stress of the material i.e., 185MPa.
- The damage region is found around the flange portion of the rim
- The fatigue analysis results clearly show that material is sustained for 1e20 cycles.
- Maximum damage occurred till the end of the 1e20 cycles is 0.2% [5].

Kaustubh V. Wankhade and Dr. N. A. Wankhade have done a review on Design and analysis of transfer trolley for material handling. Researchers have done tremendous work in the area of trolley design with greater reliability, protection and robust design also design was adequate and costs reduced. Speed of trolley can increase by increasing gearbox speed and reducing failures in gearbox. Also did ergonomic study like adjustable handle for minimum pushing efforts for users. Trolleys used in many areas like in hot rolled product handling, grain feeding trolley, in casting industries, shopping malls etc... Much more work is still needed to make use of trolleys in different Areas [6].

Ayneendra B, Mohd Salman, Jimmy Thaddeus Ojyok Attari, Marvan E have done a study on Trolley Turning and Lifting Mechanism. Nowadays trailers unload goods only in one direction which requires more time. This paper is proposing a trolley turning and lifting mechanism in order to make unloading easier. In the driver can unload the materials in multi direction without the consumption of extra time with a faster work rate and lesser human involvement. Various tests are performed to analyze efficiency and results and evaluated based on speed and power. It is proved that the proposed mechanism is more effective than unloading mechanism commonly in use nowadays [7].

III CONCLUSION

After detail study of literature we analyze that researchers have done outstanding work in this area. In this we found that in vacuum glass lifter the vacuum pump is used. Sucker cup arrangement can be useful instead of vacuum pump can helpful to reduce cost as well as improve the operation. As vacuum gripper is comfortable for object of very different size, weight can be gripped easily. For transportation the trolley can take place of overhead crane, because it will improve the transporting time. The prime interest of this paper is to have a look on the utilities and merits of sucker cup and trolley arrangement for glass handling in glass manufacturing industry. This will improve the industry performance and helpful for reducing the manufacturing cost.

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