A Review on Lifting and Assembly of Rotary Kiln Tyre with Shell by Flexible Gripper

Mr. Rahul R. Patil
Assistant Professor
Department of Mechanical Engineering
PVPIT, Budhgaon, Sangli, Maharashtra, India

Mr. Nikhil P. Ambole
Assistant Professor
Department of Mechanical Engineering
PVPIT, Budhgaon, Sangli, Maharashtra, India

Mr. Sandesh S. Awati
Assistant Professor
Department of Mechanical Engineering
PVPIT, Budhgaon, Sangli, Maharashtra, India

Mr. Altaf S. Shaikh
Lecturer
Department of Mechanical Engineering
JSPM's JSP, Hadapser, India

Mr. C. G. Harge
Associate Professor
Department of Mechanical Engineering
PVPIT, Budhgaon, Sangli, Maharashtra, India

Abstract

Heavy kiln tyre Lifting, rigging and assembly with kiln shell is done manually by use of heavy crane and labour. This traditional technique is not safe. The challenge is find out solution for ease the process and cost effective because of limitations of the rigging system, erection area, can be managed safely by the kiln tyre suspender equipped by jaws and suspender beam. This review paper deals with the study and analysis of different papers which are deals with different lifting, gripping and installation techniques and other aspects analysis with software, experimentation and optimization etc.

Keywords: Kiln Tyre, Rigging, Heavy Crane, Lifting Technique, Analysis

I. INTRODUCTION

Rotary Kiln is a heart of the production industry like cement industry and tyre plant. The kiln is a vessel of cylindrical shape, inclined slightly around 2degree from horizontal, which is rotated slowly about coaxial having maximum rpm is 5 . The raw material to be processed is fed into the end of the cylinder which is upper end called as inlet chamber. As the kiln moves, material moves down gradually towards the lower end hood and after cooler section, and may undergo a particular amount of stirring and mixing. Hot gases pass along with the kiln, the hot gases generated in an external furnace, or may be generated by a flame provide inside the kiln. Such a flame is projected from a burner-pipe which is placed in outlet end.Kiln Shell is made up of mild steel plate, normally thickness of plate between 15 and 30 mm at different are of heating area are fabricated to form a cylinder which we have consider 68m in length and 4.6 m in diameter shown in fig 1.1.and 1.2.

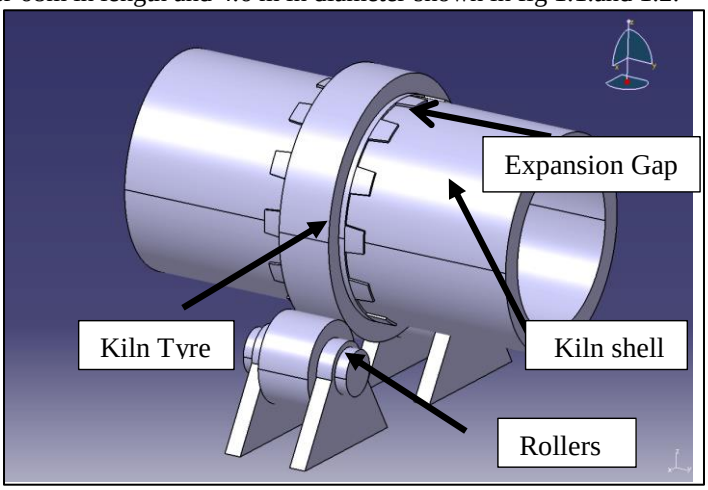

Fig. 1.1: Kiln Tyre with Shell

Fig. 1.2: General Arrangement of Cement Kiln

Presently the rotary kiln shell and its tyre are assembled manually by use of multiple heavy crane for tailing purpose and assembly required much labour ,this process is time draining activity, while transportation and assembly purpose damage may occur, unsafe work practice because of heavy weight and the assembly of kiln shell and its tyre having very tedious job because of expansion gap between them is very small and the length of kiln shell varies with different tyre shell so it is may not assembled by using sling wire rope or chain. Hence there is a need of kiln tyre lifting suspender for fast and safe handling of rotary kiln tyre.

II. LITERATURE REVIEW

For the sake of gripper designing firstly, we have to study various gripping techniques, cost effective and safe handling procedures and their applicability with help of technical content did by researchers will give the boost in the research.

A. H.P. Kritzinger, et al. "Modelling and optimization of a rotary kiln direct reduction process".

This paper illustrates the application of numerical optimization techniques in combination with the kiln model in the interrogation of a generic iron-ore reduction process. The fundamental modelling concepts are explained, followed by a description of the optimization approach. Key components in the success of the optimization are the accuracy of the kiln model and sensible interpretation of the model outputs.

B. Gualtiero Fantoni, et al. "Method for supporting the selection of robot grip".

The aim of the paper is to lay the basis for the development of an expert system for the selection of robot grippers. At the present moment the system adequately defines the grasping principles capable to perform the required operation together with some fundamental recommendations.

C. Kobia K. Lawrence, et al. "Static structure analysis of 5000tpd Rotary cement kiln using ANSYS Mechanical APDL"

Rotary cement kiln is regarded as the heart of cement manufacture in any cement plant widely used to convert raw material into clinker. The stress concentration locations can be modelled using a thicker plate alternately for all sections to ensure that there is convergence in rigidity for the entire equipment.

D. Sumesh Krishnan, et al. "Achieving mechanical stability of rotary kiln by FEM"

The investigations show that the causes of refractory failure and poor durability of refractory in large diameter kilns are due to the following factors. Grade & lining methods of refractory, Operational influence, Mechanical stresses on the refractory. It was shown that an FEA model could be used to simulate contact between two bodies accurately by verification of contact stresses between two cylinders in contact and comparison with the Hertzian equations.

E. Nina Danišová, et al. "Design of Gripper Types for an Intelligent Manufacturing - Assembly Cell"

This contribution presents the design of gripper types for an intelligent manufacturing cell. This manufacturing cell is situated at the Institute of Production System and Applied Mechanics. During the design process of intelligent manufacturing cell, and during the design process of automated tool changing system, a sequential diagram methodology was used.

F. Mohammed.Khadeeruddin, et al. "Design & Analysis of a Two-jaw parallel Pneumatic Gripper"

Pneumatic grippers are very easy to handle and are generally cost-effective because air hoses, valves and other pneumatic devices are easy to maintain. From the model we have found out that the pneumatic gripper has many advantages and is one of

the modern techniques in the world of robotics which makes pick and drop work easier and much faster than the conventional techniques.

G. Ho Choi, et al. "Design and feasibility tests of a flexible gripper based on inflatable rubber pockets"

In this paper present feasibility test results of a flexible gripper design following a literature survey on various types, design and control strategies of the existing grippers. The designed flexible gripper can handle parts of various shapes ranging from simple cylindrical parts to complex-shaped parts, Design of other elements of the flexible gripper may also affect the accuracy of part handling.

H. A. M. Zaki, et al. "Design and Implementation of Efficient Intelligent Robotic Gripper"

A new system controller using fuzzy logic based on empirical investigation of the human hand skills is proposed. The performance of the gripper system and the control algorithm was tested first by simulation. Simulation and experimental results are presented and discussed. All items in gripper construction had been modelled. A new algorithm similar to human behaviour for the grasping process was presented. Simple rule base was used. The results show the fast time response in stopping the slippage and also show an appreciated enhancement in the grasping of different objects.

I. Gualtiero Fantoni, et al. "Method for supporting the selection of robot grippers"

Once a suitable grasping strategy is chosen, this grasping principle has to prove of being compatible with the releasing phase. Therefore compatibility matrix between component characteristics and grasping-releasing principles has been proposed and developed. Finding a way to evaluate every possibility, including the variability of the objects, still requires further study and work that could be done iteratively.

J. H. Choi, et al. "Design and feasibility tests of a flexible gripper based on inflatable rubber pockets"

A flexible gripper based on the use of compliant materials (i.e., rubber) with pneumatic inflation was designed, analysed, built and tested. Feasibility experiments were performed to demonstrate and obtain an overall understanding about the capability and Limitations of the gripper.

K. M. Zaki et al. "Design and Implementation of Efficient Intelligent Robotic Gripper"

A new system controller using fuzzy logic based on empirical investigation of the human hand skills is proposed. The target is to control the applied force on the object to avoid object crushing or dropping. A new grasping and control algorithm was proposed to adjust the motion of one finger of the gripper without the risk of object crushing or dropping and also to maintain the object slip in a reasonable limit.

III. CONCLUSION

In the conclusion we found that there are systems which are related to the different techniques were used and corresponding characteristics of grasping principle too. This paper gives a different method of lifting with different approaches were discussed and will helpful for further studies of research work.

REFERENCES

[1] Gualtiero Fantoni, Saverio Capiferri Jacopo Tilli, "Method for supporting the selection of robot grippers" Procedia CIRP 21 (2014) 24th CIRP Design Conference pp. 330 – 335.
[2] Jacopo Tilli, Alberto Brando, Gualtiero Fantoni, "Gripping device for heavy and deformable materials handling: concept, design, selection and test", Procedia CIRP 21 (2014) 24th CIRP Design Conference pp. 373 – 378.
[3] Ho Choi, MuammerKoc, "Design and feasibility tests of a flexible gripper based on inflatable rubber pockets", International Journal of Machine Tools & Manufacture 46 (2006) pp.1350–1361.
[4] A. M. Zaki, O. A. Mahgoub, A.M. EL-Shafel, A. M. Soliman, "Design and Implementation of Efficient Intelligent Robotic Gripper", WSEAS TRANSACTIONS on SYSTEMS.
[5] Mohammed.Khadeeruddin, T.V.S.R.K Prasad, Raffi Mohammed "Design & Analysis of a Two-jaw parallel Pneumatic Gripper", International Journal of Computational Engineering Research, Vol.03 Issue. 12
[6] Nikhil P. Ambole, Prof. P. R. Kale , "A Review On Carbon Fiber Sprocket Design Analysis And Experimental Validation", IJSART, Volume : 2, Issue : 7
[7] Peter Kostal, Jarmila Oravcova, Miriam Matusova, "Grippers for Industrial Robots", Adeko May 18th 2010, 50TH Anniversary of Technical Science Novi Sad Machine Design ISSN 1821-1259.
[8] Nina Danisova, Roman Ruzarovsky, and Karol Velísek, "Design of Gripper Types for an Intelligent Manufacturing - Assembly Cell", International Journal On Smart Sensing and Intelligent Systems, Vol. 5, No. 4, December 2012.
[9] David T. Ricker, "Design and Construction of lifting beams".
[10] Gualitiero Fantoni, Saverio Capiferri,Jacopo Tilli, "Method for selection of robot grippers"
[11] Michael F. Ashby, "Materials selection in mechanical design".
[12] Lambsiya Vimal, K M Patel,Chinatan Mehta "Design and Analysis of Fixture for Heavy Shell Tilting".
[13] IS:8125-1976 Dimensions and Materials of Cement Rotary kilns and its components.
[14] https://en.wikipedia.org/wiki/Rotary_kiln
[15] http://www.flsmidth.com
[16] http://www.khd.com