

Design and Development of Horizontal Bearing Press Machine

Mr. Sangle Prabhakar¹ Mr. Chipade Dagaduappa Santosh² Mr. Khedkar Sandip Mahadev³

Mr. Suryawanshi Amol Anna⁴ Mr. Turakane Dadasaheb Maruti⁵

¹Assistant Professor ^{2,3,4,5}Student

^{1,2,3,4,5}Department of Mechanical Engineering

^{1,2,3,4,5}SCSCOE, Rahuri Factory, Ahmednagar, Maharashtra, India

Abstract— The KSB Group is one of the leading producers of pumps, valves & related systems. KSB is the abbreviated form of the name of the founders of the firm. Klein-Schanzlin-Becker (KSB). The company started in 1871 by the establishment of a Machine and Valve Factory. With its growth and setups from then, it was established in India in 1960. It is engaged in creating & trading of a vast range of pumps and valves, and its accessories and allied products. KSB's products are antiquated for handling & transportation of water, chemicals, sewage, etc. in individualize sectors such as agriculture, industry, energy, building, etc. KSB is a multi-national company and has its presence in all the major countries of the world through its subsidiaries. KSB products transport water as well as any other liquid to where it is required, efficiently, charily and reliably. In applications that chain from building services to industrial processes, water engineering, mining and energy technology KSB pumps and valves supply and distribute water to private, public and industrial buildings. They unbridled heating and air-conditioning problems. Chemical, petrochemical & much other companies use them to transport aggressive, corrosive, volcanic, solids-laden and viscous liquids.

Key words: Bearing, Horizontal Bearing Press Machine

I. INTRODUCTION

KSB pumps are a pump and valve manufacturing company in which all the pumps are manufactured with strict processes that are personally inspected. Pumps manufactured, find applications in all fluid sectors and hence are in variety of specifications. The Bearings are press on a pump shaft using different types bearing press machine. (Viz. Vertical/Horizontal Bearing Press Machine)

It includes –

- 1) Reduction in this unnecessary time consumption to help increase the number of bearings being pressed on shaft per day.
- 2) Reducing the workers fatigue by easing the setup process.

The horizontal bearing press machine is used for pressing on the shaft. The pressing machine consists of a common dolly which is suitable for various replacements of dollies to accommodate respective model. At the end of cycle the assembly of shaft and bearing is complete which further press on bearing bracket using vertical bearing pressing. It is used for assembly of two bearing on each side of shaft (pump side and motor side).

II. LITERATURE SURVEY

A. Thrust Ball Bearing Design and Applications

1) Author - Robert P. Tata

Ball bearings are used primarily to sustain rotating shafts in mechanical equipment. They can be found in everything from private computers to passenger cars. They are of inoffensive

design and can be precision made in mass production quantities. They can buttress heavy loads over a vast speed range and do it virtually friction free. They come in many other sizes & shapes, are relatively inexpensive, and need little or no maintenance. They have predictable design lives and handling characteristics and are truly a valuable special to the rotating equipment industry of today. A ball bearing consists of an inner ring (IR), an outer ring (OR), a implement of balls, and a separator to contain the balls. The outer diameter of the inner ring & the inner diameter of the outer ring have a dyke in which the balls roll on. This groove is commonly called the pathway. The raised surfaces on every side of the track are called the shoulders. The balls are held equally spaced all over the annulus of the bearing by the separator. The prime dimensions of the bearing are the bore (B), outside diameter (OD), and the width (W). For most bearings, the radius of curvature across the pathway of an inner ring is held to 51 to 52% of the ball diameter while the radius of flexion across the track of the outer ring is held to 53 to 54% of the ball diameter. As the pathway radius of flexion approaches 50% of the ball diameter (100% of the radius), the stress between the ball and pathway reduces; however, it also moves the contact of the ball higher up the pathway wall producing more friction as the balls revolve all over the bearing. For ball bearings, the best balance between stress & wear is attained with the track curvature slightly above 50% as described above for inner and outer rings. [7]

B. Deflection of Flexural Members - Macaulay's Method

1) Author - Dr. Colin Caprani

Macaulay's Method is a means to find the equation that describes the deflected form of a beam. From this equation, any deflection of interest can be promote.

Before Macaulay's paper of 1919, the equation for the deflection of beams could not be found in closed form. Different equations for bending moment were trite at other locations in the beam.

Macaulay's Method enables us to write a single equation for bending moment for the absolute length of the beam. When coupled with the Euler-Bernoulli theory, we can then integrate the expression for bending moment to obtain the equation for deflection.

Before looking at the deflection of beams, there are some lead-in results needed and these are introduced here. The above is the essence of Macaulay's Method. The idea of the especial brackets is routed in a strong mathematical background which is required for more forward understanding and applications. So we next examine this background, whilst trustful not to lose sight of its essence. [8]

C. Fluid Power Hydro-Line Cylinders

1) By Eaton

There's certain energy at Eaton. It's the power of integrating the competencies of some of the world's most respected

names to build a brand you can trust to visit each power management require. The energy created supports our commitment to powering business worldwide.

As the world's requirement for high-efficiency hydraulic systems for mobile and stationary applications develop, Eaton is helping to solve these challenges more reliably, efficiently, and sustainably. Our goal is simple; to provide unique solutions across a vast range of markets that keep businesses on the leading edge of change. Visit Eaton.com/hydraulics/fusion. This design has been engineered to feed the ability to tune the cushion experiment for an optimized deceleration profile. Our patented floating ring an alternate ball check design allows maximum acceleration. This acceleration profile translates into faster cycle times and increased production. [9]

III. BLOCK DIAGRAM

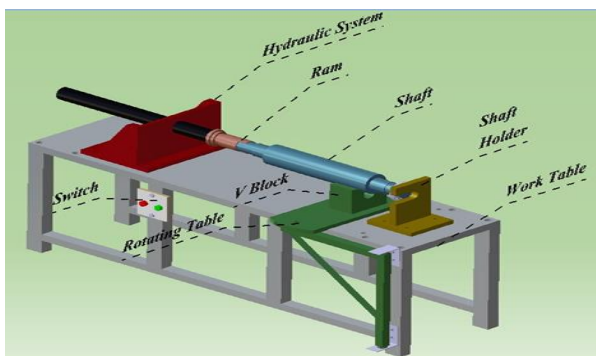


Fig. 1: Modified Solution of Horizontal Bearing Press Machine

A. Block Diagram Description

1) Hydraulic Unit:

Hydraulic unit is the heart of the system. Pressurised oil is provided to the double acting cylinder, to move the ram in forward and reverse direction.

2) Hydraulic Ram:

Ram is one of the main part of the machine. Ram is actuated by means of hydraulic pressure. Ram having stroke length of 500 mm is used to press bearings on pump shaft.

3) Shaft Holder:

Second main part of the machine is shaft holder. Axis of shaft holder and axis of hydraulic ram is in one line. Shaft holder holds the shaft on one side and keep shaft in line with ram axis.

IV. ADVANTAGES

- Very useful in reducing human effort
- Saves time
- Overall Productivity Increases

V. APPLICATIONS

- Bearing pressed on pump shaft

VI. CONCLUSION

- 1) The concept of group project is set to be part of our syllabus with the view of inculcating within us the ability to apply the concepts of design and face practical problems. In this project, initially the entire process was observed and the time required for the process was

recorded. This brought into light some major problems where modifications were required. All the important documents and drawings of the existing setup were analyzed and working on the modified machine was started.

- 2) In this horizontal bearing press machine the bearing pressing operation is done by hydraulic system, during operation worker need to hold the shaft on machine & problem occurred during handling of shaft. By modification of different parts like ram, shaft holder, and implementing one adding mechanism for overcome the problem which are occurred during the operation and during handling of shaft. Because of these modification,
- 3) Production speed is increases
- 4) Worker safety has done.
- 5) Operation time is reduces. Following graph will show us reduction in operation time for various pumps shaft.
- 6) The time study reveals the most important benefit of the modified horizontal bearing press machine. The reduction of time achieved is nearly 50% per pump shaft. The average time reduction achieved for different types of pumps from graph is 49.18%.

REFERENCES

- [1] Dr. R. K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi I. Publication, Jan 2005.
- [2] Johannes Brandlein, "Ball & Roller bearing: theory, design and Application", wiley publishers, 3 rd edition, march 1999
- [3] E. Marston and F. Zezula, "Piping Joints Handbook", May 2000.
- [4] V. Bhandari, "Design of Machine Elements", 3rd Edition, Tata McGraw Hill.
- [5] "PSG Design Data Book", k. KalaikathirAchchagam Publication.
- [6] Thrust Ball Bearing Design And Applications, Author - Robert P. Tata, Jan 2005
- [7] Deflection Of Flexural Members - Macaulay's Method, Author - Dr. Colin Caprani, May 2004
- [8] Fluid Power Hydro-Line Cylinders, By Eaton, Jan 2005
- [9] KSB Company Brochure, 2015.
- [10] Nilson and Nawy "Deflection Calculation"