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DESIGN, ANALYSIS AND MODIFICATIONS OF PNEUMATIC SYSTEM INTO CHAIN DRIVE MECHANISM IN CB 170 - 3WAY DRILLING MACHINE

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Abstract:

The project mainly emphasis on problem faced in machine shop of the company. The operation involves loading and unloading the work piece in a CNC Machine. The pneumatic system that helps in this process undergoes failure due to pressure fluctuation and considerably reduces the production. The rod end undergoes failure in the operation. Thus an alternate method becomes mandatory .The project implies on the use of a mechanical system. The most popular mechanical system used for transmitting motion is the Flat Belt Drives and Chain Drives. The project mainly implies on the design and use of chain and roller conveyers as an alternate solution for the pneumatics. The drafting part is done using PRO-E and the analysis is done using ANSYS.

Key words: PRO-E, ANSYS, CB 170-3 WAY DRILLING MACHINE.

1. INTRODUCTION

This machine mainly emphasis on problem faced in machine shop of the company. The operation involves loading and unloading the work piece in a three way drilling machine. The pneumatic system that helps in this process undergoes failure due to pressure fluctuation and considerably reduces the production.

Fig.1. CB 170 -3 Way Drilling Machine is mainly emphasis on problem faced in machine shop of the company.

The rod end undergoes failure in the operation. The most popular mechanical system used for transmitting motion is the Flat Belt Drives and Chain Drives. The drafting part is done using PRO-E and ANSYS. This design when implemented can sufficiently increase the production rate.

2. PNEUMATIC SYSTEMS

Pneumatic systems are extensively used in industry, where factories are commonly plumbed with compressed air or compressed inert gases. The rod end undergoes failure in this operation. It uses double acting rope actuated pneumatic cylinder. Due to pressure fluctuation in the rod end it undergoes failure mainly due to air supply fluctuation. The productions will stoppage the entire production line. The most popular mechanical system used for transmitting motion is Flat belt Drives and Chain Drives. The drafting parting is done using PRO-E and the analysis is done using ANSYS.

Fig.2.

3. CHAIN DRIVE MECHANISM

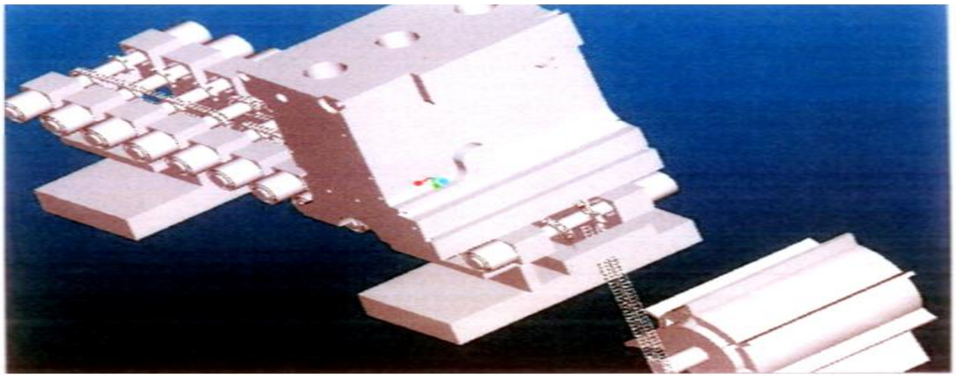
Chain drives are used to transmit power between a drive unit and driven unit. Basically roller chains belong to power chain category and are widely used in industry.

Fig.3.

Its precision assembly provides noise free operation.Chain drives are long and reliable work life. It provides maximum strength and wear resistance.

4. ASSEMBLY OF CHAIN DRIVE

The movement of work piece is possible only through this guide way. Our project involves the designing the guide way using chains and rollers. The final assembly of chain drive is designed is can be done in PRO-E.



5. DESGN CALCULATIONS

1. Total load = Tangential load + Centrifugal tension + Sagging tension

2. Centrifugal tension = mv^2 (M varies from 0.7 to 2.90)

   $= 0.7\times 7.56^2$

   Centrifugal tension = 40N

3. Velocity = (no of teeth × pitch × rpm) / (60 ×1000)

   = 17 × 20 × 1350 / (60 × 1000)

   Velocity = 7.56m/s (Taking chain of 08B1 type we get)

4. Tangential force = 1020N/v

   = 1020 × 7 / 7.56

   = 933.3N

5. Sagging tension = k × w × a (a = 1.02m)

   = 6 × 6.86 × 1.02

   Sagging tension = 973.7 N [K = 6(for horizontal drive)]

6. Weight = mg = 0.7 × 9.81 = 6.86 N

7. Design load = k_s × total load

   $= (k_1\times k_2\times k_3 \times k_4\times k_5 \times k_6) \times$ total load

$= 1.25 \times 1\times 1\times 1\times 1\times 1 \times 933.3$

Design load = 1217.12 N

Here, from PSG Design Data Book

$K_1 = 1.25$(mild shock), $K_2 = 1$(adjustable support),

$K_3 = 1$(a= (30 to 50) p), $K_4 = 1$(horizontal drive)

$K_5 = 1$(drop lubrication), $K_6 = 1$(8hrs/day)

8. Factor of safety = B.L / T.L

= 18200 /1217.12

$= 14.9533 \approx 15$

Notations:

V = velocity of the chain

N = rated capacity

B.L = Braking load

T.L = Total load

So a chain of type 08B1 made of alloy steel and hardened to 40 to 50 RC popularly known as Single Roller Chain in the industrial field can be used.

CONCLUSION

These designs can effectively reduces the cost and increase the production on a shift basis, the above said could be proved only implemented it and by making effective improvements.

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REFERENCES

[1] H. Zheng, Y.Y. Wang, Y. Nouguchi,'Efficient modeling and prediction of meshing noise from chain drives', Journal of Sound and Vibration, Volume 245, Issue 1, 2 August 2001, Pages 133-150.
[2] James C. Conwell, G.E. Johnson, 'Experimental investigation of link tension and roller-sprocket impact in roller chain drives' Mechanism and Machine Theory, Volume 31, Issue 4, May 1996, Pages 533-544.
[3] R.M. Peters, D. Fitzgeorge, 'Kinematics and jockeying of an eccentric chainwheel drive' Journal of Mechanisms, Volume 6, Issue 2, Summer 1971, Pages 177-193.
[4] Tomio Koyama, Kurt M Marshek, 'Toothed belt drives',Mechanism and Machine Theory, Volume 23, Issue 3, 1988, Pages 227-241.
[5] Bahir H Eldiwany, Kurt M Marshek, 'Experimental load distributions for double pitch steel roller chains on polymer sprockets', Mechanism and Machine Theory, Volume 24, Issue 5, 1989, Pages 335-349.