

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Development and Performance evaluation of kinematic link variable speed drive

Mr. Vivek Vasant Warang ¹,Mr. Akhil Hanbiraro Mali²,Mrs. Ankita Amit Sutar³,Mr. B. B. Patil ⁴,Mr. Pawan Narenadr Shinge⁵,Mrs. S. K. Mestri⁶

dr. bapuji salonkhe institut of engineering and technology

ABSTRACT :

There are many machines and mechanical units that under varying circumstances make it desirable to be able to drive at an barely perceptible speed, an inter mediate speed or a high speed. Thus a infinitely variable (or stepless speed variation in which it is possible to get any desirable speed. Some mechanicals hydraulic and electrical devices serve as such stepless drives. However the torque Vs speed characteristics of these drives do not match that of stepless drives at increased driving torque at low speeds. Hence the need of an stepless drive with the following characteristics Stepless or infinitely variable speed, Wide range of speed variation ie(Nmax to Nmin), Shifting form one speed to another should be shockless Minimum no of controls for speed changing. Ease of operation. Compact construction.

The project aims at design and development analysis and testing of kinematic linkage based variable speed drive. Kinematic synthesis of the linkage will be done using Kinematic overlay method, Design of the parts will be done using Unigraphix Nx and the analysis of the components will be done using Ansys workbench.

The unit will be fabricated and testing will be done using test rig to plot the performance characteristic of the drive.

Introduction

In many drives , it is desirable to be able to shift from one speed to another without stopping the machine and also be able to obtain any speed between the max and min . A design which meets these requirements is the

'KINEMATIC LINKAGE VARIABLE SPEED DRIVE'.

There are many machines and mechanical units that under varying circumstances make it desirable to be able to drive at an barely perceptible speed, an inter mediate speed or a high speed. Thus a infinitely variable (or step-less speed variation in which it is possible to get any desirable speed. Some mechanical hydraulic and electrical devices serve as such step-less drives. However the torque Vs speed characteristics of these drives do not match that of step-less drives at increased driving torque at low speeds.



Hence the need of an step-less drive with the following characteristics

• Step-less or infinitely variable speed.

- Wide range of speed variation ie(N-max to N-min).
- Shifting form one speed to another should be shockless .
- Minimum number of controls for speed changing .
- Ease of operation.
- Compact construction .

Concept Schematic



Test and Trial

Test and Trial

RESULT TABLE:

SR	LOAD (gms)	SPEED	TORQUE	POWER	efficiency
NO		(rpm)	(N.M)	(watt)	
1.	0.5	44	0.24525	1.130177	22.60355
2.	1	43	0.4905	2.208983	44.17966
3.	1.5	41	0.73575	3.15936	63.18719
4.	2	39	0.981	4.006993	80.13985
5.	2.5	34	1.22625	4.366595	87.33189
6.	3	28	1.4715	4.315223	86.30446
7.	3.5	23	1.71675	4.135422	82.70844





Graph shows that the torque increases with the decrease in the output speed indicating that the device will slow down slightly if the load is increased .

Graph of Power Output indicates a rising trend upto 39rpm output speed and then slightly drops indicating that the operating range of the device is below 40 rpm to obtain maximum power output from the device.



Graph of Efficiency indicates a rising trend upto 39rpm output speed and then slightly drops indicating that the maximum efficiency operating range of the device is below 40 rpm to obtain maximum efficiency from the device.

Result and Discusssion

- 1. Maximum torque obtained is 1.71 n-m
- 2. Maximum Power obtained is 4.135 watt
- 3. Maximum efficiency obtained is 82.70 %

Conclusion

The radial piston pump was modified to developed as a replacement to gear box , the kinematic linkage was designed and the fabrication of device was done. Test Showed that Maximum torque obtained is 1.71 n-m

Maximum Power obtained is 4.135 watt

Maximum efficiency obtained is 82.70 %

- 1. [[1] Norman H. Beachle , Andrew A. Frank ,College of Engineering University of Wisconsin, Madison ,"Continuously Variable Transmissions: Theory And Practice" August 1979
- 2. [2] William T. Beale," Automatic Transmission with Stepless, Continuously Variable Speed And Torque Ratio" Pat.2006
- 3. [3] Brian S. Andersen,"An Investigation Of A Positive Engagement Continuously Variable Transmission" August 2007
- 4. [4] Yukawa." Department of Mechanical Engineering Iwate University" 4-3-5 Ueda, Morioka, Iwate, 020-8551 (Japan)
- [5] Jeffrey M. Araujo, Michael A. DeMalia, Christopher M. Lambusta, "Switch-Mode Continuously Variable Transmission "ME-JDV-0902 , April 2009
- 6. [6] Derek Frei Lahr," Continuously Variable Transmission With External Cam"U.S. Pat. (2011) 7,878,935
- 7. [7] Shawn R. Wilhelm, James D. Van de Ven," Design and Testing of an Adjustable Linkage for and Robotics, November 2013, Vol.5
- [8] Dennis W. Hong, Derek F. Lahr." The Operation and Kinematic Analysis Of A Novel Cam-Based Infinitely Variable Transmission. September 2006
- 9. [9] Jiten Patel, G.K. Ananthasuresh." A kinematic theory for radially foldable planar linkages" January 2007.
- [10] Wayne Paul Bishop, Wilmington DE(US)."Positive Drive Infinitely Variable Transmission" U.S. Pat.2011 [11] Avinash A. Kawale, Dr. F.B.Sayyad, Desig