

# A Review on Overview of Gearless Transmission Through Elbow Mechanism

U. Chakradhar<sup>1</sup>, K. Muniteja<sup>2</sup>, T. Charanteja<sup>3</sup>, E. Lokesh<sup>4</sup>, Ch. Tulasi Ram<sup>5</sup>, T. Ajay<sup>6</sup>, I. Karthik<sup>7</sup>  
<sup>1,2,3,4,5,6,7</sup>UG Student, Department of Mechanical Engineering, Audisankara College of Engineering & Technology, Gudur, India

**Abstract:** Most of the machines transmit power from the input to the output with the help of gears. But, the efficiency of power transmission by spur gears is less due to friction losses. From the design point of view, there is a 10% energy loss per engagement for spur gears. Also, the construction of gears is complex and thus, costlier. The gearless elbow transmission is a very economic and efficient mechanism and has shown an efficiency of up to 92%. This paper aims at the gearless mechanism of transmitting power by Elbow mechanism. Most of the elbow mechanisms have a fixed position at a particular angle (60 or 90 degrees).

**Keywords:** Gearless Transmission, Elbow Mechanism

## 1. Introduction

In today's world, as limited quantity of the resources available, it is necessary to utilize the resources in such way that it gives maximum of them (i.e., Output). For transmitting motion and power from one shaft to another which are non-parallel or intersecting and co-planar bevel gearing are generally employed. But there are some inherent disadvantages associated with bevel gearing stated as complexity in manufacturing, high cost of replacement. To overcome all these difficulties, we have a mechanism which transmits motion between the two non-parallel (intersecting) and co-planar shafts. The mechanism is known as Gearless elbow mechanism is equipment consisting of elbow rods, hub and shaft. Gearless elbow mechanism works on the principle of slider and kinematic chain principle.

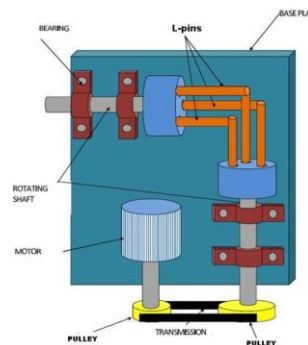
## 2. Working principles and methodology

The Gearless or Elbow transmission mechanism is an equipment for power transmission at any desired angle between the drive shaft and the driver shaft. The creation of this mechanism would reveal that it contains a number of connections between 3 and 8, the more links there are, the smoother the operation will be. These connections slide into the housing to form a sliding and sliding pair. This mechanism has 3 of those sliding pairs. These cylinders are placed in a hollow tube and fixed at 60° from each other. This experimental configuration is mounted on a wooden table. Power is supplied by an electric motor.

We have fabricated 4 pins gearless elbow mechanism. Gearless elbow mechanism is portable and compact equipment.

Mechanism consists of 2 hubs, 4 elbow rods, 2 shafts, motor (A.C. motor 1hp), belt drive. The motor and belt drive is coupled to the end of any one shaft. As the power is supplied to the shaft from the motor through belt drive the shaft rotates along with hub, the elbow rods placed in the holes of the hub slides in and out of both the hubs due to this the power from one shaft is transmitted to the another.

## 3. General layout of elbow mechanism



The mechanism is made of SRRS pair (sliding revolute sliding) sliding pair between the input hub hole and the link; revolute pair between link and input hub; revolute pair between link and output hub; sliding pair between holes in output hub and the link. The rotational motion of input shaft is converted into sliding motion of links which is then converted to rotational motion of the output shaft.

## 4. Comparison with geared mechanism

Gear System	Gearless System
Manufacturing method costly	Manufacturing method less costly
Manufacture on special purposed machine	No need of special purpose machine
complex calculations	simple calculations
No interchangeability	freedom of interchangeability
cause of failure-	cause of failure-
Pitting, corrosion, erosion and fatigue have saver effect	Pitting, corrosion, erosions and fatigue have effect less severely
Replacement of entire gear sets needs to be done	Replacement of defected pins only
Lubrication and Cooling -Complex system -Cooling is big issue	Lubrication and Cooling- -Simple -Easy to cool
Torque transmitting capacity	Torque transmitting capacity
Used in high torque applications	low torque applications

### 5. Advantages of elbow mechanism

1. Mechanism is very simply due to elimination of value mechanisms.
2. Mechanism is small.
3. No crank & crank shaft are necessary.
4. Lesser vibration because the reciprocating force are perfectly balanced.
5. Smooth & high speed operation can be easily obtained by cause of elimination of the value setting linkage.
6. Complete freedom of Interchangeability.
7. Power could be transferred to any desired angle.
8. Low cost manufacturing.
9. Simple cooling system.
10. Portability of parts.

### 6. Conclusion

The gearless power transmission is best and running ideas of the technology. It has a good scope in future to replace the heavy usage of gears. After complete study of the mechanism, we understood that this mechanism is mainly applicable to low cost applications where torque is low to medium. With future development in low friction materials (graphene coating) and stronger composite materials, the efficiency and capacity of this mechanism can be increased. Also if instead of bent links, bolted links or links held by universal joints are used then

transmission is possible even when angle changes on the go.

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