



# Design and Fabrication of Motorized Cranking Device

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## Abstract:

In southern railways maintenance department in Diesel Loco Shed at Erode facing problem in setting firing order in P4 and G4 locomotives by using a manual cranking lever. When using the lever the labours are affected by health issues, more working time and economical loses. In order to solving the difficulty and increasing the economical benefits also reducing the health issues of the employees motorized cranking device is made with the required parameters.

**Key word:** locomotives, cranking lever, cranking device.

## 1. INTRODUCTION

Diesel locomotives are undergone for maintenance process in certain periods. During the maintenance the engine is overhauled. After the overhauling process engine is assembled but the firing order is not set. To set the firing order in the diesel locomotives P4 and G4 is difficult. This type of locomotives cranking lever is used for particular job. More than members are involved to complete the work and it took more than three hours for complete the particular job. Two persons are used for applying load in the lever, one person used for setting the lever profile correctly in the flywheel, one man for tappet checking. When the man power is directly involved for heavy works it leads to health issues, more man power is required, more time is required and economically profit is less. Our project objective is to reduce man power and also minimize the working hours of cranking P4 and G4 locomotives. In our project we can use AC Servo Motor that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotor.

## 2. PROBLEM IDENTIFICATION

In manual cranking of the P4 and G4 diesel locomotives man power are required more than two persons following that manual cranking, tappet timing check, one revolution check these made the work completion working time more and also health issues to the employees such as back pain, sprain, etc.,

## 3. POSSIBLE SOLUTIONS

- Hydraulic Device
- Pneumatic Device
- Electric Motor Device

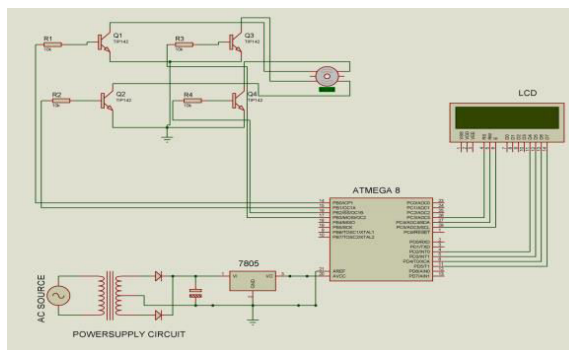
## 4. WORKING OF THE DEVICE

The motorized cranking device is coupled with a pinion and the pinion coupled to the AC Servomotor. The pinion will be

merged to the ring gear which is mounted in the P4 and G4 locomotives, during the tappet clearance adjustment and one revolution check. After merging the pinion to the ring gear the motor is ready to rotate the ring gear. The required degree ( $22.5^{\circ}$ ) of the angle to stop the motor is controlled by the micro-controller. The speed of the motor and the angle of the motor were already programmed to the micro-controller. So the required speed and angle of the motor were highly accuracy in AC Servomotors. The angle is mentioned for the firing order positions of the 16 cylinder in the locomotives

### (i) CIRCUIT DIAGRAM

The circuit diagram of the motor is given as follows



Here the micro-controller ATMEGA8 is used for controlling the angle positioning, forward and reverse operations by pre-programmed coding. The LCD screen helps to find out the running RPM of the motor and the angle rotated by the motor. For every electrical component power supply unit is required, as per the requirements the power supply unit supplies 5V power supply is given to the drive and other components for motor the required power is supplied for the required process. When the motor is operated the power is used to induce the program to done its work which is pre-programmed in the micro-controller. The each  $22.5^{\circ}$  angle sets the firing order of 16 cylinders in the P4 and G4 locomotives. Within the  $360^{\circ}$  rotation the 16 cylinders get set with the firing order as specified for the locomotive. This work is made easier through the motorized cranking device and

the required out put can be obtained easily in both forward and reverse directions.

### 5. ADVANTAGES

- Reduces man power
- Avoid health issues
- Economical benefits
- Work time reduces

### 6. DISADVANTAGES

- Initial cost is high
- Proper mounting should required

### 7. CONCLUSIONS

From the identified problem we made a solution with motor coupled to a pinion. By proper mounting of the motor in the engine we can rotate the ring gear or flywheel gear this movement controlled and enough torque is produced to rotate the ring gear and reduce the man power, working stress and working time of the employees.

### 8. RESULT AND DISSCUSSION

Thus the motorized cranking device is made to rotate the ring gear at 22.5° angle using AC servo motor for reducing the above mentioned problems. This device will made the work easier when compared to the manual cranking method. The timing and working effort will be reduced, also the economical benefits is more and the excess labours can be used for the another works.

### 9. DESIGN

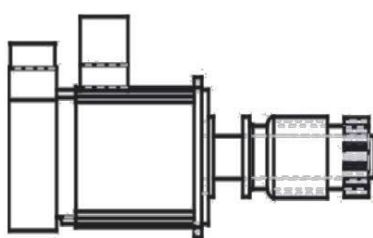
#### (i) 3D VIEW



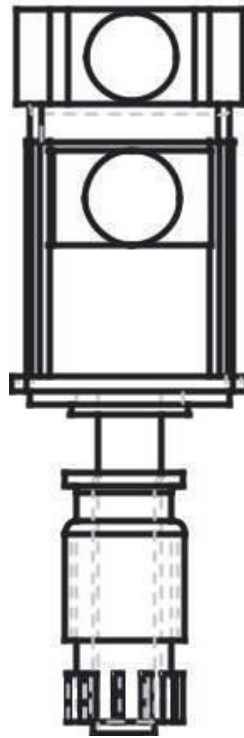
#### (ii) 2D VIEW



FRONT VIEW



LEFT SIDE VIEW



TOP VIEW

### 10. REFERENCES

- [1]. Vedam Subramanian, “Electric Drives (concepts and applications)”, Tata McGraw-Hill, 2001Nagrath .I.J. & Kothari .D.P, “Electrical Machines”, Tata McGraw-Hill, 1998
- [2]. Rattan, S.S, “Theory of Machines”, 3rd Edition, Tata McGraw -Hill, 2009
- [3].Rajput. R. K., “Thermal Engineering” S.Chand Publishers, 2000
- [4].Kothandaraman.C.P. Domkundwar. S, Domkundwar. A.V., “A course in Thermal Engineering”, Fifth Edition,”Dhanpat Rai & sons, 2002
- [5]. Bhandari V, “Design of Machine Elements”, 3rd Edition, Tata McGraw-Hill Book Co, 2010
- [6]. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett “Mechanical Engineering Design”, 8th Edition, Tata McGraw-Hill, 2008.
- [7]. Jain K.K. and Asthana .R.B, “Automobile Engineering” Tata McGraw Hill Publishers, New Delhi, 2002 , Programming, and Applications with the 8085”, 5th Edition, Prentice Hall, 2008
- [8]. Web source <http://www.meracalculator.com/physi cs/ electromagnetism/ ac-to-dc-converter.php>
- [9].Websource [http://m-wikihow-com. cdn. Amp project. org/ v/s/ m.wikiho w.com/Calculate-Horsepower? Amp =1&amp \\_js\\_ v=0.1& usqp=mq331AQECAEoAQ%3D%3D#](http://m-wikihow-com. cdn. Amp project. org/ v/s/ m.wikiho w.com/Calculate-Horsepower? Amp =1&amp _js_ v=0.1& usqp=mq331AQECAEoAQ%3D%3D#)