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Wireless Communication between Engine Test Cell and Console Corridor Control Panel

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ABSTRACT

Due To Development Of The Microelectronics, Wireless Communication Technology Undoubtedly Provides People With A Convenient, Fast And Effective Mode Of Communication. It Has Been Used Widely In Industrial Production For Data Acquisition And Transmission Of Complicated, Hostile Environmental Conditions And Other Places That Are Inconvenient To Reach. Utilizing This Technology We Are Establishing "Wireless Communication Between Engine Test Cell And Corridor Control Panel" For Engine Testing Department, Engine Division, Beml Mysuru. We Are Making Use Of Microcontroller That Is Based On The Arduino Uno Platform Which Is The Core Of Monitoring And Display System. Magnetic Pickups And Load Cell Together Helps To Collect Data Of Speed And Torque Of The Engine Respectively. The Acquired Data Is Transmitted Through Rf433mhz (Tx/Rx) Module And Finally Displaying The Results Of Communication On A Display.

Keywords: Arduino Uno, magnetic pickups, load cell, RF433MHZ, wireless communication.

I. INTRODUCTION

BEML Ltd Company was incorporated by Government of India as a public sector under the control of Ministry of Defence. Among many manufacturing units spread across the country, one is located at Mysuru, comprising of Equipment Division and Engine Division.

Engine Division: Engine Division manufactures heavy duty Diesel Engines for application on a wide variety of Earth Moving, Mining and Construction Machinery. BEML Engines are used on Bull Dozers, Dump Trucks, Motor Graders, Wheel Loaders, Pipe Layers, Hydraulic Excavators, Loading Shovels, C Crane, Aircraft
Towing Tractors, Backhoe Loaders, Water Sprinklers, Water Well Rigs and DG sets.

Engine Testing Department

The Engine is being assembled in the assembly shop and it is moved to the Engine Testing Department for testing. There is a reference to test the Engine called as EPTS (Engine Performance Test Standard as per ISO 9249).

Engine testing site comprises of Test Cell and Corridor. The Test Cell is equipped with Test bed (to accommodate the Engine) and Dynamometer (to load the engine to be tested on to the test bed). The control panel is installed at the console corridor which is nearly 2.5 meter height & 5 meter distance from the Test Bed.
During testing, the test cell operator and the control panel operator have to communicate with each other for adjusting different engine parameters like low idle speed, high idle speed, power and torque to satisfy the EPTS.

II. METHODS AND MATERIAL

In the existing system, during engine testing the test cell operator has to go to the control panel repeatedly to see the changes which he adjusted in the first attempt and to reiterate the process until achieving the required values.

The test cell operator has to depend on the hand gestures of the control panel operator to adjust the parameters in FIP (Fuel Injection Pump) of Engine.

This time consuming activity is because of "absence of FIP parameters display within the test cell". These primitive methods increases the total time required to test the engine (increases test bed time i.e., consumption of more resources) and also leads to miscommunication and inaccuracy.

Considering these difficulties and to decrease the engine testing time, we are displaying the engine parameters (speed, torque and power) within the test cell so that the test cell operator can see the display and adjust the FIP parameters very accurately and quickly.

In the proposed methodology, Magnetic Pulse Pickup and Strain Gauge Load Cell sensors outputs are processed in Mother Board. The processed signal from Mother Board is read by Arduino microcontroller which is installed at the console corridor end and is transmitted through RF transmitter .It is then received by RF receiver of another Arduino this is installed in the test cell area and various engine parameters are displayed on any convenient form of digital display.

The components used as shown in the block diagram (Fig 1) include the following:

1. A sensor, Magnetic Pulse Pickup that gives the output as frequency which is directly proportional to speed of engine.
2. Another sensor called strain gauge load cell which gives electrical signal as output whose magnitude is directly proportional to the force being measured.
3. In signal conditioning block the sensors outputs i.e., a frequency output from the magnetic pick up and mille volts signal from strain gauge load cell are converted into suitable form(0 to 10 v dc)for further process
4. Arduino microcontroller; very important part of the system where programming is written and also acts as a platform for conversion of data and other operations. We use 2 Arduino Uno boards; each at transmitter and receiver end.
5. RF433MHz transmitter (Fig 2) and receiver (Fig 3) pair is used for communicating the data between two Arduinos; through a wireless means.
6. A digital display system is provided inside test cell area for displaying various engine parameters (speed, torque and power) for monitoring purpose.

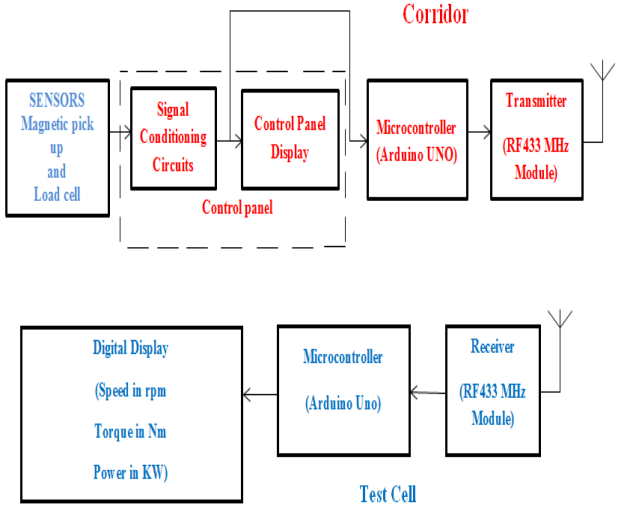

Figure 1. Block Diagram of Proposed System

III. RESULTS AND DISCUSSION

Engine parameters such as Speed and Torque are sensed by magnetic pickups and load cell respectively, corresponding Power is calculated using speed and torque values. These are read by microcontroller, transmitted wirelessly using

RF433MHz and displayed on a display for monitoring.

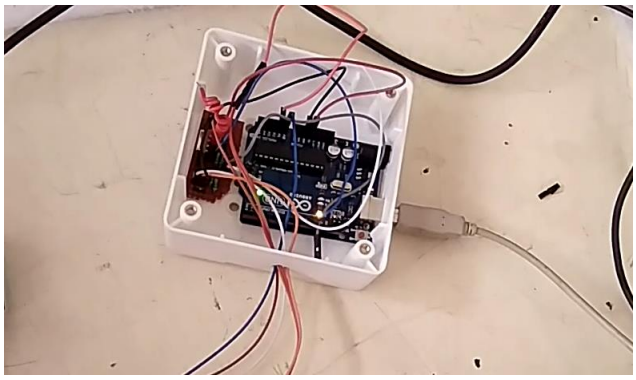

Figure 2. Transmitter

Figure 3. Receiver

IV. CONCLUSION

We have successfully completed the project and are able to transmit the data wirelessly and receive the same using arduino and display the received data (various engine parameters) on a suitable digital display for monitoring and controlling.

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