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Remote Access to Real Time Data Logger for Cam-Jump Phenomenon using IoT

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ABSTRACT

In this project we design and develop cam-follower analysis experimental setup. Moreover, we show that this system could be successfully used as an advanced method to study the experiment for students. The project design of this study included the following steps:

Our project help to study the cam jump phenomenon , this design plot the graph of the weight(gm) vs speed(rpm) in digital form show on attached PC or on mobile using IoT.

This system typically includes the experimental setup , Data logger , proximity Sensor, ESP8266 controller , Wifi-connections and Computer or Mobile for plot graph.

This project setup help to study the variations of the change in applied weight vs speed.

This technology reduce the errors in readings of the parameter which involve in manually reading , and improve accuracy.

Key Words: **cam jump , IoT , sensors , Arduino, Rpm.**

1. INTRODUCTION

This Cam and follower mechanism is a preferred mechanism due to its important functions of all most all the reciprocating machines used in transportation, medical, and production industries etc. A cam is a rotating or translating part of the cam follower mechanism that can transmit from one type motion to another.

➢ Cam jump phenomenon is starting in the cam follower mechanism after their some speed range this project is develop for to plot this cam jump critical speed on applying different weight.

➢ The idea of the Internet of Things has changed as a result of the confluence of several technologies, including embedded systems, wireless communication, and the Internet. (For example, automation of control systems, wireless sensor networks, and embedded systems).

➢ This project is to develop cam-follower analysis experimental setup using IoT and make them advanced and of new technology for getting reducing error make simple to understand experiment. and involve IoT in mechanical Labs.

➢ This development achieved by the IoT and sensors which is done on the cam-follower analysis experimental setup, which is also work as preventive maintenance by avoiding cam jump phenomenon.

1.1 PROBLEM STATEMENT

Develop an IoT-based cam-follower analysis experimental setup to measure the speed (rpm) of a camshaft and plot a graph of weight versus speed for cam jump phenomenon. This system aims to eliminate human errors, reduce effort, and save time associated with manual RPM measurement and graph plotting. By using sensors and IoT technology, the setup will facilitate fast, accurate, and real-time data logging and digital graph plotting of weight(gm) vs speed(rpm)

1.1.1 Visualization Context and Motivation: In traditional cam analysis experiments, measuring the speed of the camshaft using a tachometer is sometimes prone to human errors. Manually plotting graphs of weight versus speed on paper is time-consuming. These challenges necessitate an automated solution to enhance accuracy and real time data visualization when conducting cam-follower analysis experiments.

1.2 OBJECTIVES

➢Combining Classroom and Laboratories together.

➢Develop cam-follower analysis experimental setup and make it advanced.

➢ Bringing information on screen more quickly than system depending on human intervention.

➢ Enable remote monitoring and control on cam jump phenomenon of cam-follower analysis experimental setup setup , offering accuracy.

➢ It also reduces the efforts and errors of manually testing.

1.3 SCOPE

This project will help develop or connect mechanical setups to IoT and involve IoT in mechanical labs. Improve the methodology of analysis of readings or obtained data.

2. SIGNIFICANCE

a. **System to Systems (SoS) wireless Communication**- IoT systems connected to physical system, this is an important concept to grasp. When data from one system is coupled with data from other systems, we get results.

b. **Digitally Data Recording and Monitoring System-** In this hyper connected world, digitally systems can record, monitor and adjust each interaction between connected things. The physical world meets the digital world and they can cooperate with the help of IoT based wireless communication system.

c. **Creating Opportunities-** The IoT creates opportunities for more direct integration of the physical world into computer-based systems without human interuption, resulting in efficiency improvements, economic benefits, and reduced human interventions.

3. LITERATURE SURVEY:

3.1 Review on cam follower mechanism

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INTRODUCTION:- Because cam and follower mechanisms perform vital duties in nearly every industry that uses reciprocating machinery, including production, transportation, and medicine, they are the mechanism of choice. A cam is a component of the cam follower system that rotates or translates to transfer motion from one type to another. Actually, regular to irregular motion may be transmitted at a very low cost utilizing a cam follower mechanism, which is exceedingly difficult even at greater costs by using other available advanced ways. A designer or researcher can choose from a wide range of cam and follower couplings according to their needs, as recommended by Mahesh R. Mali et al. By using different optimization approaches, cam and follower mechanisms are also used to boost the efficiency of the I.C. engine.

OBSERVATIONS: There are two categories for the jumping phenomenon in a cam follower setup: no load and spring length. Any one of the two quantities is maintained constant at any given time. Repetitive motion is measured with a digital tachometer. The phenomenon of jumping happens at a specific voltage or position, and then the sound of the follower and cam striking changes. We take the readings at this moment.

CONCLUSION : Both the follower and the cam do not obey one another when leaping quickly. In any event, jumping is not recommended since it violates the laws of limited motion and creates dangerous working conditions, excessive noise, and vibrations. We found that the design of the cam and follower mechanisms is mostly influenced by the spring's compression and stiffness. The follower will be able to jump the cam if there is no compression in the spring, which will cause the cam and follower to break apart and have no contact at all. Jump is therefore undesired in follower and cam devices. Therefore, to ensure that the cam and follower pair stay in contact throughout the whole rotation, we should always apply enough spring force and preload to them. Future iterations of this work could detect vibration in addition to leap speed. When designing a cam and follower system, the designer should be informed of the maximum speed of the cam or jump speed as well as the vibration frequency.

3.2 Review on IoT based monitoring and speed control of an induction motor

Ashwini B. Kaule, 2Manjusha R. Bachawad, 1M.Tech.(EPS), 2 Assistant Professor , Department of Electrical Engineering, 1Goverment college of Engineering , Aurangabad, India

INTRODUCTION :- The most widely used kind of motor in all sectors of days is the induction motor. The essential qualities of an induction motor are low maintenance requirements, easy operation, a high power factor, and a lower cost of ownership compared to other motor types. Because of these benefits, induction motors also have strong starting torque, sustained overload capacity, and effective speed regulation. The most common applications for induction motors are in industrial motors, electric vehicles, and agricultural motors.

CONCLUSION:- This study describes the use of sensors and a Wi-Fi module to provide Internet of Things-based induction motor status monitoring. Additionally, you may use the PWM approach to regulate the speed of an induction motor. A significant amount of an induction motor's safety and protection may be ensured. Furthermore Accurate control of the induction motor may be easily done with the use of IOT.

4. METHODOLOGY

Taking “Theory of Engineering as Experimentation” by H. Schank Jr. the Design of experimentation will be planned as per the classical plan of experimentation and the test cell will be developed, whose trial will be taken by defined process of testing in the said reference book.

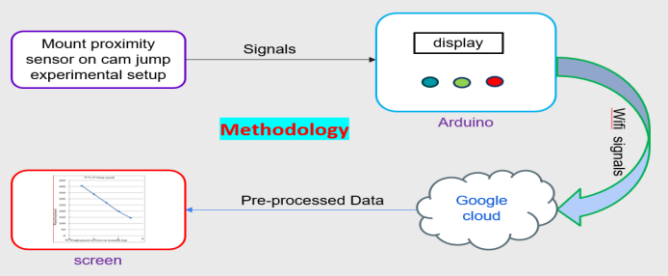


Fig no. 1 - Methodology

5. COMPONENTS

a) Cam-Follower analysis experimental setup:- cam and follower mechanisms perform vital duties in nearly every industry that uses reciprocating machinery, including production, transportation, and medicine, they are the mechanism of choice.

b) Proximity sensor : This sensor is used to identify objects, however in this project, we utilize the object detection to measure or compute the Speed in RPM (revolutions per minute).

c) Controller (ESP8266) :- A programmable, open-source microcontroller board that is inexpensive, versatile, and simple to use, the ESP8266 may be included into a wide range of electrical projects. In addition to controlling relays, LEDs, servos, and motors as an output, this board can interact with other Arduino boards, Arduino shields, and Raspberry Pi boards. Other features of the gadget include Bluetooth, internet access, motor control, and many more. The Arduino-uno board is mostly preferred over other Arduino boards because to its lower cost. When compared to other Arduino devices, this board is the least expensive. Beginners like this board over other boards primarily for this reason.

The esp8266 wi-fi module is used in this project to exchange data wirelessly between two or more devices. Devices connected to the mobile application using a wi-fi module, or simply the internet of things, may be identified by their IP address by entering it on the application.

d) Display :- OLED Display is used to show the how much weight (gm) is applied and the speed(rpm) senced by the proximity sensor.

e) **Computer or Mobile :-** To open webpage and see the graph.

6. EXPERIMENTAL SETUP

Fig no. 2 – Cam Analysis Experimental(project) setup

7. PROJECT SETUP

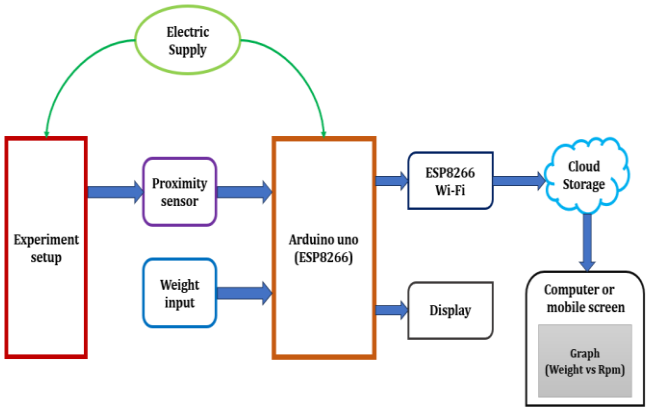


Fig no. 3 – Block diagram of Project setup

8. WORKING PRINCIPLE

The block diagram represents a system for measuring RPM (rotations per minute) and analyzing weight and RPM using an Arduino Uno with an ESP8266 module for Wi-Fi connectivity. Here's a detailed working principle of the system:

a. Electric Supply : The system starts with an electric supply that powers the entire setup, including the experiment setup, sensors, and the Arduino Uno.

b. Experiment Setup : This is cam-follower analysis experimental setup is a motorized unit consisting of a cam shaft driven by a D.C. motor. The shaft runs in a double ball bearing. At the free end of the cam shaft a cam can be easily

mounted. The follower is properly guided in bushes and the type of the follower can be changed to suit the cam under test. A spring is used to provide controlling force to the follower system. Weights on the follower rod can be adjusted as per the requirements. The arrangement of speed regulation is provided.

It is physical setup where the measurements will take place.

c. Proximity Sensor : The proximity sensor is responsible for detecting the rotational speed (RPM) of a cam-shaft which is attached to motor in the experiment setup. It sends this data to the Arduino Uno.

d. Weight Input : Using this circuit we give the information or data of weight involved in the experiment to the Arduino Uno. By manually clicking keys (increase weight, decrease weight and reset) provided on it.

e. Arduino Uno (with ESP8266) : The Arduino Uno, equipped with an ESP8266 Wi-Fi module, serves as the central processing unit. It collects data from both the proximity sensor and the weight input. The Arduino processes this data and performs necessary computations.

f. ESP8266 Wi-Fi Module : The ESP8266 module provides Wi-Fi connectivity. It sends the processed data from the Arduino to a cloud storage service for further analysis and remote monitoring.

g. Cloud Storage : The data received from the ESP8266 is stored in the cloud. This allows for remote access to the data and ensures that it is safely backed up.

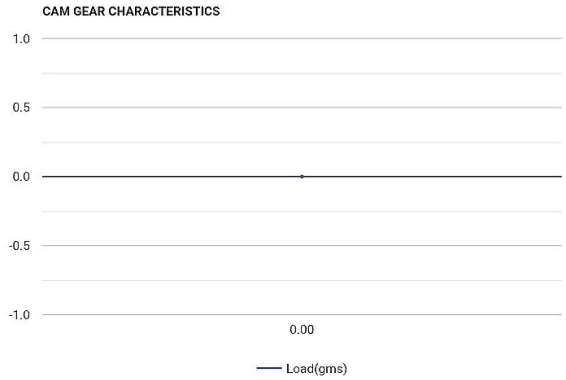
h. Display : The Arduino Uno also sends data to a display device, providing real-time feedback and visualization of the weight(gm) and speed(rpm)measurements.

i. Computer or mobile screen : The data stored in the cloud can be accessed and used to generate graph on webpage showing the relationship between weight(gm) and speed(rpm). This visualization aids in the analysis of the experimental results.

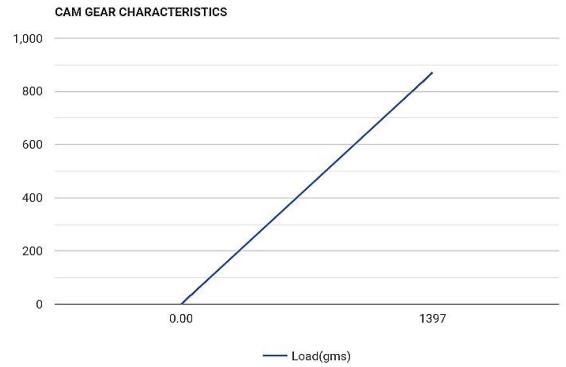
Overall, the system allows for real-time measurement, processing, and remote monitoring of weight(gm) and Speed(rpm) data through display interfaces and with easy access to visualized results on computer or mobile screen , in form of 'weight vs speed' graph which is helpful to find cam-jump speed or critical speed at particular weights on computer or mobile screen.

9. RESULT

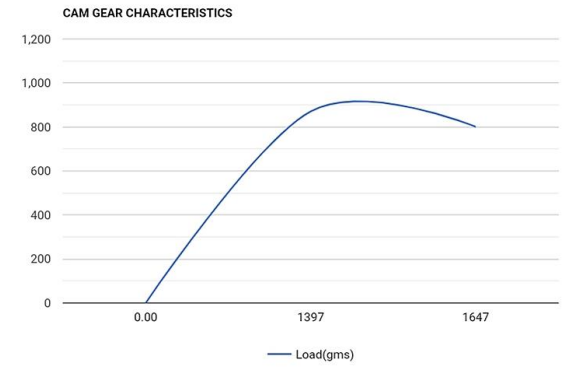
a. Cam on 0 rpm and on 0 load



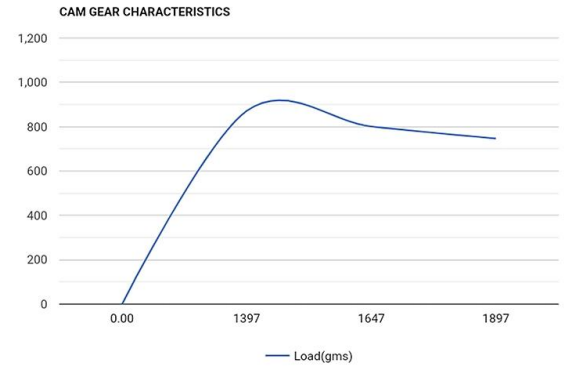
b. Cam jump speed at weight 1397 gm



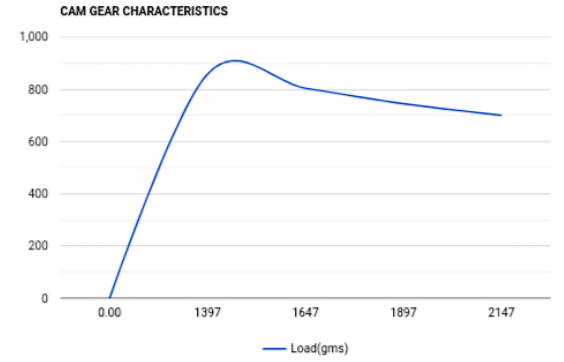
c. Cam jump speed at weight 1647 gm



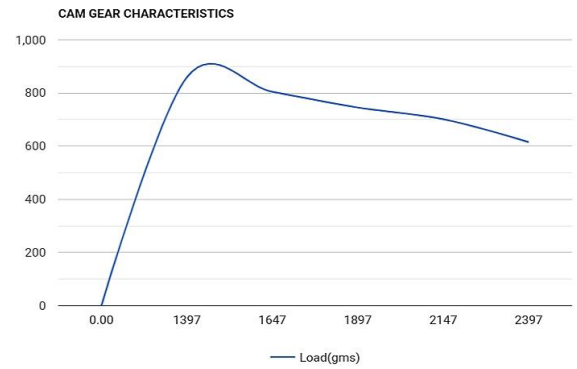
d. Cam jump speed at weight 1897 gm



e. Cam jump speed at weight 2147 gm



f. Cam jump speed at weight 2397 gm



10. CONCLUSIONS

a. Combining classroom and practical room together, Hence it is satisfied by doing this project.

b. To provide a comprehensive solution for monitoring and analyzing cam jump occurrences remotely.

c. By leveraging IoT technology, the system enables continuous data collection, storage, and analysis of cam jump events.

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