ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 7, Issue 11, November 2018

Performance Evaluation of an Automobile Alternator

Dr. D. Aravind[1]

Assistant Professor, University Science Instrumentation Centre, Madurai Kamaraj University, Tamilnadu, India[1]

ABSTRACT: Thesedays, the automotive sector has been rapidly developing. This research work was carried out with an intention to provide useful engineering solution for the automotive and mechanical industrial sectors through its compatibility and low cost involved in manufacturing and performance. The transport necessity has enhanced throughout the world. Though automobiles have become as unavoidable requirement to everyone, its performance and efficiency reduces day by day due to various causes. This Alternator Performance Evaluation of Motor cycles testing could play a vital role in automotive testing to provide live report of the Electrical system of motor cycle.

KEYWORDS: Automation, Testing, Alternator, ESA PCI DAS, Labview.

I. INTRODUCTION

Automation can be simply defined as “the level that human work is replaced by machines”. The effectiveness of any automation system depends entirely on the quality of its underlying electrical, mechanical and control systems. Now days all the vehicles have been automated searching to implement new technologies.

II. AUTOMOBILE TESTING

Managing evaluation of an automobile testing system is essential since it verifies vehicle quality, durability and emissions testing system. A vehicle is inspected to ensure that it conforms to regulations safety, emissions or both. Inspection can be required at various times, e.g., periodically or on transfer of title to a vehicle.

A. TYPES OF AUTOMOBILE TESTING

Automobile testing many classified into two types. They are on-road and industrial testing.

ON – ROAD TESTING

Vehicle on – road test implies measuring all parameters are logged at simple rates and result output in any format. Testing parameters like acceleration, deceleration, engine temperature in different gear performance logged, as well as brake test and alternator test are inclusive. And also testing instrumentation capabilities like abs and esc system, etc., can be carried out by gathering data around our proving ground or in ‘real-world’ situations on the public highways. We also use the latest generation software programmes to analyse and interpret the test data.

INDUSTRIAL TESTING

While developing new products, even small improvements can create a leading edge, providing us with a decisive advantage over the competitor, development time and cost are crucial in the

development of new technology. If a new product is being tested by manufacturer, it is called an industrial test. In vehicle testing, break testing, engine test, alternator test take a major role.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 7, Issue 11, November 2018

The objective of this research article is to manage designing a test bed for direct testing of an automobile alternator along with all its electrical components.

III. WHY ALTERNATOR?

Alternator manufacturers require a reliable and cost effective testing system to test the conditions of an alternator. Since industries need a single instrument to manage testing of the alternator and its electrical components at the same time, it is of foremost importance to develop and manage a test bed.

IV. METHODOLOGY

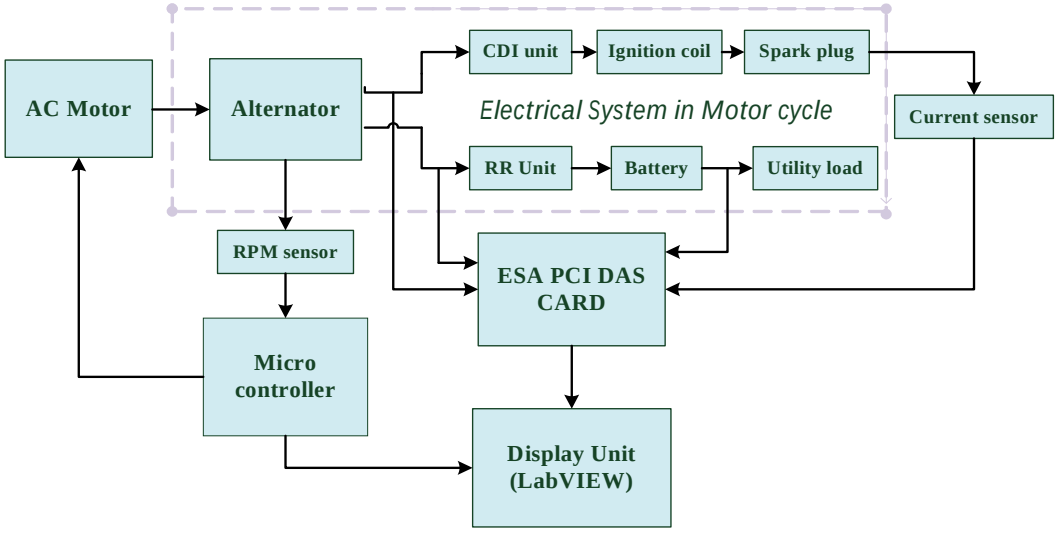


FIGURE A: BLOCK DIAGRAM OF THE SYSTEM

The methodology to manage designing a test bed includes,

- Construction of a test bed to mount AC motor and its electrical components connected with alternator system.
- Incorporation of sensors and signal conditioning to measure vital parameters of the alternator.
- Designing a data acquisition system to measure the wheel speed, alternator condition that runs the coils, starting coil, CDI unit, rectifier / regulator unit etc.
- Developing a graphical user interface system to acquire the measurement values from the data acquisition system.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 7, Issue 11, November 2018

V. TESTING AND ANALYSIS

The test and analysis plays an important role in measurement system. Here the all measured result will be analyzed using specific software. The vehicle parameters are all measured using **ESA PCI DAS** card, microcontroller and the measure value is analyzed in the LabVIEW instrumentation software.

A. ALTERNATOR TESTING

This system would measure several parameters such as wheel speed, coils status value, electrical components status value and help us in comparing with its standard values. This system, thus make the possibility of managing real world analysis. The details of a random testing conducted are as follows:

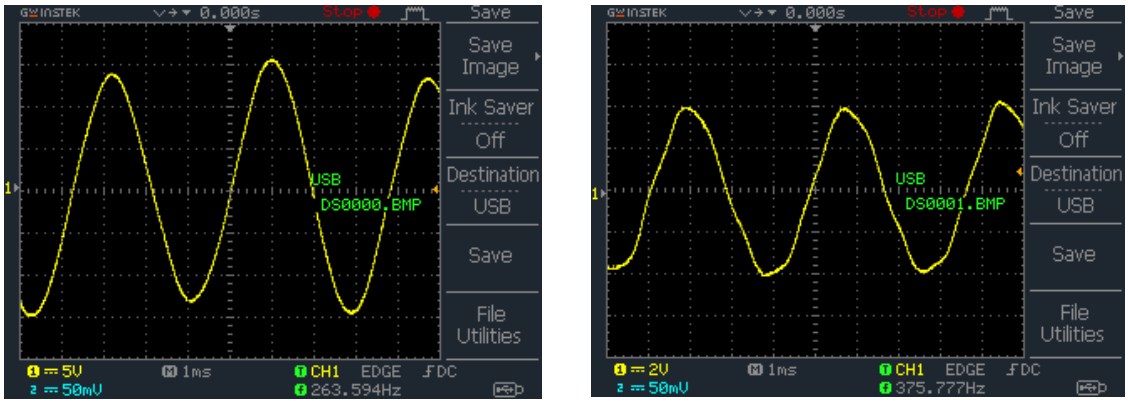


FIGURE B: PEAK VOLTAGE VOLTAGE OF STARTING COIL VS PEAK VOLTAGE OF LIGHTING COIL

S. No	Time (sec)	Alternator Starting Coil (V)	Alternator Lighting coil (V)
1.	1	226.97	3.14
2.	2	224.49	3.17
3.	3	223.08	3.13
4.	4	220.24	3.14
5.	5	218.83	3.10
6.	6	216.70	3.05
7.	7	214.58	3.08

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 7, Issue 11, November 2018

8.	8	212.81	3.01
9.	9	213.16	3.05
10.	10	210.68	3.04
11.	11	210.76	2.98
12.	12	211.27	3.04
13.	13	212.54	2.97
14.	14	213.79	2.98
15.	15	214.33	2.99

TABLE A: ALTERNATOR COILS VOLTAGE MEASUREMENT

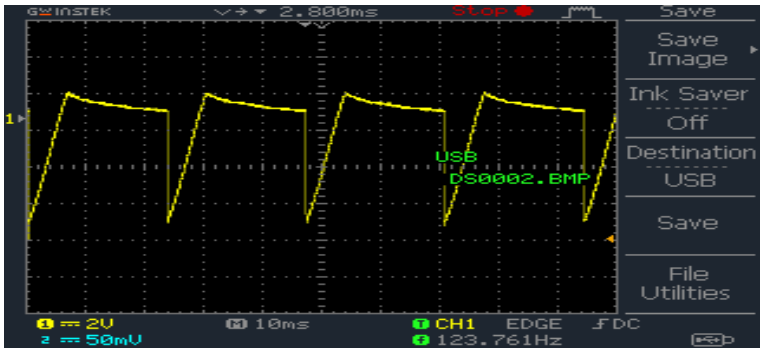


FIGURE B: CRO OUTPUT OF CDI UNIT

S.No	Time (sec)	CDI Unit (V)	Rectifier/Regulator Unit (V)
1.	1	263.24	2.48
2.	2	265.46	2.33
3.	3	267.76	2.21

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 7, Issue 11, November 2018

4.	4	263.88	2.18
5.	5	265.22	2
6.	6	263.12	1.93
7.	7	261.65	1.54
8.	8	262.48	1.25
9.	9	260.92	1.07
10.	10	261.27	1.61
11.	11	263.61	1.60
12.	12	262.28	1.56
13.	13	261.33	1.55
14.	14	262.49	1.42
15.	15	260.68	1.52

TABLE B: CDI UNIT AND RR UNIT VOLLTAGE MEASUREMENT

B. OUTPUT VIEW FOR MICROCONTROLLER PROGRAMS

Test programs are written to check each peripheral of microcontroller individually. The output view in flash magic terminal window of some tested programs:

UART

The serial communication program is written in keil µ vision software. The output view as in terminal window:

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

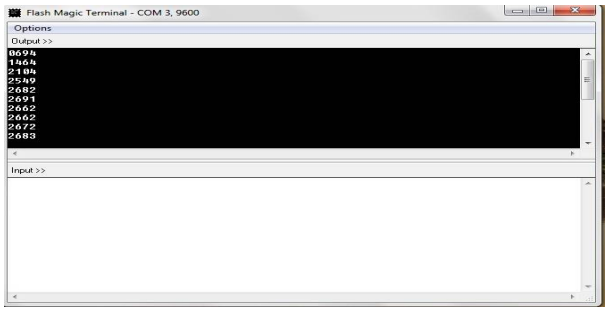
(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 7, Issue 11, November 2018

RPM COUNTING

The RPM counting program is also written in keil µ vision software. The frequency capture is done using an external interrupt 8051 microcontroller and then it is converted into time in minutes using calculation and it is send to serial port via rs232. The output view in terminal window is as follows:



VI. SUMMARY AND CONCLUSION

To summarize testing details,

- the lighting coil is not good, the electrical component of CDI unit is good, regulator/rectifier is not good.

In the fast growing industrial world, automation in vehicle plays a major role in future. Today it requires more number of high cost instruments to manage testing of vehicle alternator and its electrical components. The system analyzed would be of low cost, flexible and more importantly is a single instrument. Moreover, this system will be reducing the human effort and can be extended for managing overall testing of the vehicle.

REFERENCES

1. Virtual Instrumentation using LabVIEW, Jovitha Jerome.
2. The 8051 Microcontroller and Embedded systems using Assembly and C (Second Edition), Muhammad Ali Mazidi, Janice Gillispie, Mazidi,Rolin D. McKinlay.
3. Famouri, P., Cawthorne, W. R., Clark, N., Nandkumar, S., Atkinson, C., Atkinson, R., ... & Petreanu, S. (1999, January). Design and testing of a novel linear alternator and engine system for remote electrical power generation. InPower Engineering Society 1999Winter Meeting, IEEE (Vol. 1, pp. 108-112). IEEE.
4. Werst, M. D., Perkins, D., Pratap, S. B., Spann, M., & Thelen, R. F. (1989). Testing of a rapid-fire compensated pulsed alternator system. Magnetics, IEEE Transactions on, 25(1), 599-604.
5. Cohen, B. J., Medical Terminology: An Illustrated Guide, 4th ed. Philadelphia: Lippincott, 2004. Cromwell,L.,F. J.Weibell, andE. A. Pfeiffer,Biomedical Instrumentation and Measurements, 2nd ed. Englewood Cliffs, NJ: Prentice-Hall, 1980.
6. Dorland, N. W. (ed.), Dorland's Illustrated Medical Dictionary, 30th ed. Philadelphia: Saunders, 2003.
7. Ekelman, K. B., New Medical Devices: Invention, Development, and Use. Washington, DC: National Academy Press, 1988.
8. Enderle, J. D., S. M. Blanchard, and J. D. Bronzino, Introduction to Biomedical Engineering, 2nd ed., San Diego: Academic, 2005.
9. Firkin, B. G., and J. A. Whitworth, Dictionary of Medical Eponyms, 2nd ed. Park Ridge, NJ: Parthenon, 1996.
10. Geddes, L. A., and L. E. Baker, Principles of Applied Biomedical Instrumentation, 3rd ed. New York: Wiley, 1989.
11. D.Patranabis, Principles of Industrial Instrumentation, Tata McGraw Hill Publishing Ltd., New Delhi, 1999.
12. B.C.Nakra and K.K.Chaudary, Instrumentation Measurement and Analysis, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1985.