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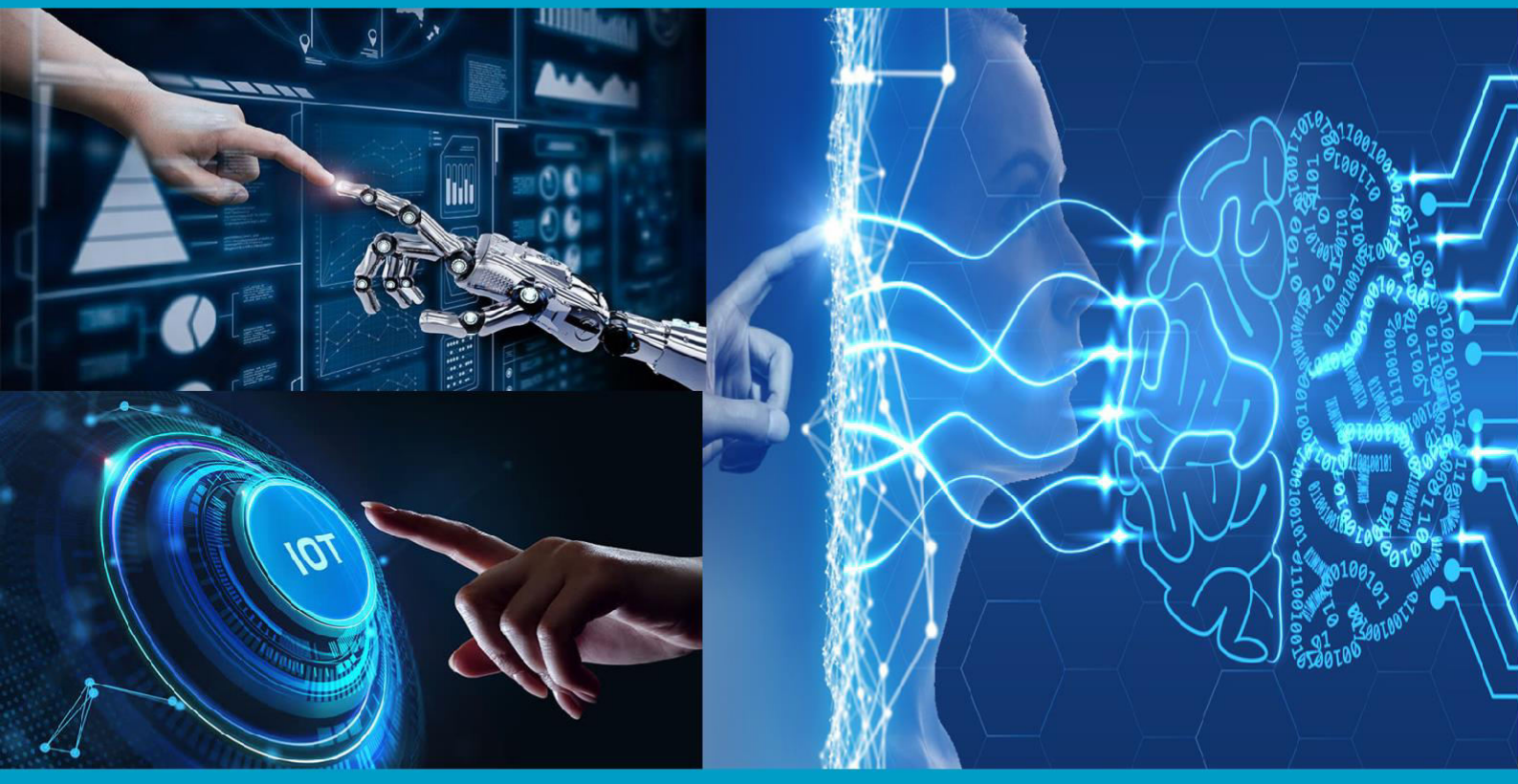

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Real Time Monitoring Electrical Diesel Generator Through-IOT

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ABSTRACT: Electronic device control and monitoring are common uses for the Internet of Things. People can monitor gadgets over an internet network from anywhere in the globe thanks to a combination of internet and embedded system technology. An inexpensive way to keep an eye on the power parameters of a diesel generator, like voltage, current, running hours, and fuel status from an external fuel tank, is to install an Internet of Things power monitoring system. An Arduino Uno microcontroller serves as the system's processor and Internet of Things module, sending data to a web server. The AC voltage and load current are monitored using ZMPT101B and SCT-013-030, respectively. On the other hand, the running hours parameter is determined by the observed voltage's condition. The outcomes demonstrated that those metrics may be seen in real time by the system on the web application. It additionally shown running state of generator and online or offline status of the system. Furthermore, this technique assisted technicians to determine maintenance time accurately.

KEYWORDS: Diesel Generator, Node MCU, Arduino Microcontroller, Current Voltage and Temperature Sensor

I.INTRODUCTION

The most crucial source of power for electronic gadgets is electrical power. Electrical power is required in industrial systems in order to maintain control systems operating around the clock. It's also important to have a stable power source to avoid breaking any gadgets. A diesel generator is a type of generator used to produce electricity using fossil fuels. It can serve as a primary energy source or a backup. For a generator to last as long as possible, maintenance is required. An operator can utilize running hours as a guide to choose the right time for generator maintenance. It's crucial to keep an eye on the voltage and current to ensure a steady power supply. IoT development accelerates as more individuals have access to the internet. As mobile phones have advanced, consumers can readily use their mobile phones to check technological devices. All IoT begins with a sensor. In order for a sensor to continuously sense the parameters it is utilized for, it must be connected to a controller or processor. The Internet of Things (IoT) connects everything, everywhere in the cosmos. It has global communication capabilities with nearly everything. A control signal or recognized data from this world can be used in the communication. It is a typical form of data transfer over the internet that takes several forms.

Using a GSM module, measured data would be communicated as SMS. ZMPT101B was used to conduct additional research on power monitoring systems. Measurements of voltage were obtained using it. It was attached to the Arduino microcontroller's analog input pin, and polynomial regression was used for the computation. By a generator monitoring system that gauges power and fuel level was completed. This study used a buoy method to assess the fuel level. The buoy would move in response to a rise in liquid level, rotating the rheostat sensor to provide a new resistance value at each fuel level.PZEM-004T sensor was used to measure power, and the findings were compared with CM3286-20 clamp meter.

II.EXISTING SYSTEM

Combustion engine vehicles are being replaced by electric ones. On the other hand, there was a lot of uncertainty about the systems and upkeep of electric vehicles when they were originally introduced. These skepticisms are waning, according to the present trend in the car industry. The issue with electric vehicle heat management is currently the most worrying one that still exists. Thermal management is necessary in traditional automobiles in order to cool the internal

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combustion engine. The engine's heat is removed by the radiator system, coolant, and thermostat. Thermal management in electric cars refers to keeping the motor, power electronics, and batteries cool. Let's examine why thermal management is so important in electric cars in more detail. The diesel packs' performance, longevity, and expense in comparison to electric vehicles have a direct reliance. At ideal temperatures, the diesel's health, charge acceptance during regenerative braking, and discharge power available for starting and acceleration are all at their finest. Fuel efficiency, diesel longevity, and electric vehicle driveability all decrease with rising temperatures. Diesel thermal management is essential when taking into account the total thermal impact of the diesel on electric vehicles.

III.PROPOSED SYSTEM

In proposed system Fuel level sensors in this suggested system can be measured using a variety of techniques, such as ultrasonic, capacitance, and resistance approaches. An ultrasonic sensor will be used in this investigation to measure the fuel level. A single-phase voltage sensor will be used to monitor voltage and running hours simultaneously, while a CT sensor will measure current. The two main components of the system are the software and the hardware. The components and schematic drawings make up the hardware part. I/O connectivity and IoT architecture make up the software portion. A comprehensive system that measures voltage, current, fuel level, and running hours has not yet been developed, according to earlier research. This paper's goal is to track power metrics including fuel level, voltage, current, and as running hours, which are calculated using an Arduino Uno to detect voltage. One board microprocessor utilized for intelligent projects and prototyping is the Arduino microprocessor board. The sensor's parameters are to be transmitted over the internet and are observable using a web application.

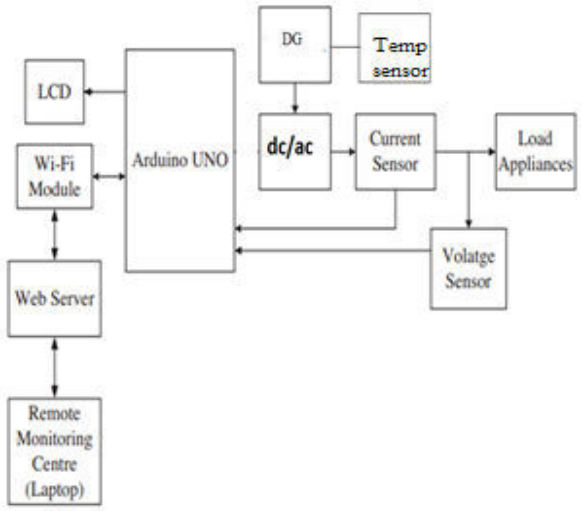

Figure.1.Block Diagram

SYSTEM REQUIREMENTS
NODE MCU

Figure.2.Node MCU

NodeMCU is an open-source Lua based firmware and improvement board uniquely focused on for IoT based Applications. It remembers firmware that runs for the ESP8266 Wi-Fi SoC from Espressif Systems, and equipment which depends on the ESP-12 module.

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LCD Display

LCD can show numbers, characters and designs. The showcase is interfaced to I/O port of microcontroller (P0.0-P0.7). The presentation is in multiplexed mode. Inside 1/tenth of a second the following showcase turns on. There show will bring about constant showcase of tally because of industriousness of Vision.

VOLTAGE SENSOR

Figure.4.Voltage Sensor

Generally, a sensor is an electrical device used to detect as well as respond to a particular type of signal like optical or electrical. Implementation of sensor techniques in voltage or current has become an outstanding option toward the measurement of voltage & current methods. The advantages of sensors over conventional methods for measuring mainly include less size and weight, high safety, high accuracy, nonsaturable, eco-friendly, etc. It is feasible to merge both the current and voltage measurement into a physical device with tiny and solid dimensions. This article discusses an overview of the voltage sensor and its working.

CURRENT SENSOR

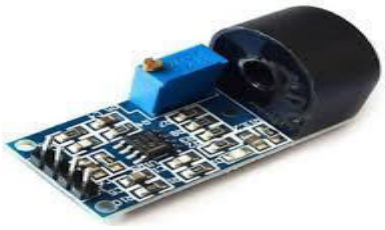

Figure.5.Current Sensor

In electrical engineering, current sensing is any one of several techniques used to measure electric current. The measurement of current ranges from picoamps to tens of thousands of amperes. The selection of a current sensing method depends on requirements such as magnitude, accuracy, bandwidth, robustness, cost, isolation or size. The current value may be directly displayed by an instrument, or converted to digital form for use by a monitoring or control system. Current sensing techniques include shunt resistor, current transformers and Rogowski coils, magnetic-field based transducers and others.

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ARDUINO UNO R3 MICROCONTROLLER

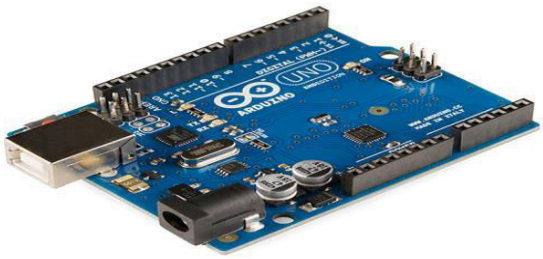

Figure.6. Arduino Board

The Arduino Uno R3 is a microcontroller board based on the ATmega328 IC. It has been 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contain everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

TEMPERATURE SENSOR

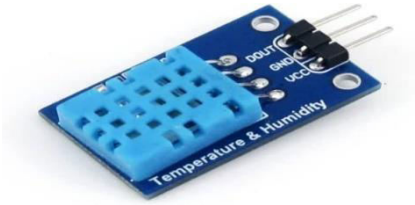

Figure.7. Temp sensor

A temperature sensor is a device, typically, a thermocouple or resistance temperature detector, that provides temperature measurement in a readable form through an electrical signal. A thermometer isthe most basic form of a temperature meter that is used to measure the degree of hotness and coolness. Temperature meters are used in the geotechnical field to monitor concrete, structures, soil, water, bridges etc. for structural changes in them due to seasonal variations.

DIESEL GENERATOR

Figure.8. Diesel Generator

A diesel generator (DG) (also known as a diesel genset) is the combination of a diesel engine with an electric generator (often an alternator) to generate electrical energy. This is a specific case of engine generator. A diesel compression-ignition engine is usually designed to run on diesel fuel, but some types are adapted for other liquid fuels or natural gas (CNG). Diesel generating sets are used in places without connection to a power grid or as an emergency power supply if the grid fails, as well as for more complex applications such as peak-lopping, grid support, and export to the power grid.

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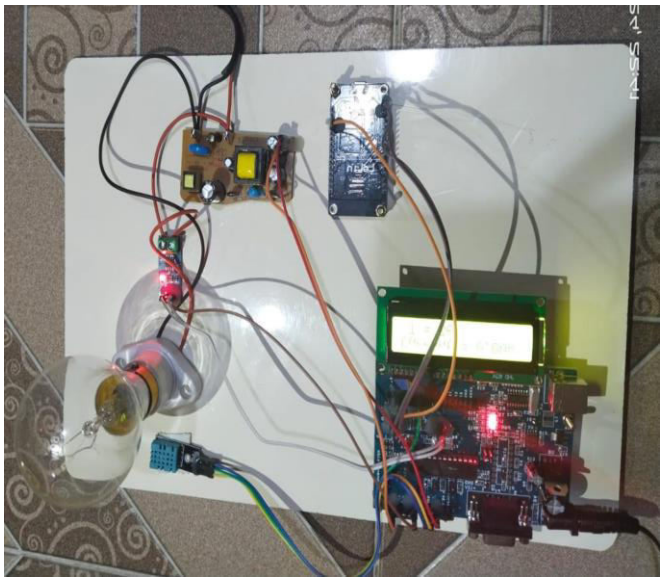


Figure.9.Hardware Model

IV.CONCLUSION

This paper uses computer simulations in conjunction with the Industrial Internet of Things (IIoT). The Arduino Uno, SIM900 GSM/GPRS module, US-100 ultrasonic sensor, ZMPT101B voltage sensor, SCT-013-030 current sensor, LCD interface, and other components were all part of the system that was described in this paper. The successful implementation of 20 KVA diesel generators has been achieved. The outcomes shown that sensor parameters could be displayed by the system on the web application. It also showed the generator's operating status and whether the system was online or offline. Additionally, this technology assisted operator in accurately determining maintenance time. In the future, this system can be connected to a control system so that a user can use a cell phone to remotely control a generator. Additionally, abnormality detection might be included to identify issues in diesel generator.

REFERENCES

1. M. S. Hosen, J. Jaguemont, J. van Mierlo, and M. Berecibar, “Diesel lifetime prediction and performance assessment of different modelling approaches,” iScience, vol. 24, no. 2, pp. 102060, Feb. 2021, doi: 10.1016/j.isci.2021.102060.
2. R. Xiong, F. Sun, Z. Chen, and H. He, “A data-driven multi-scale extended Kalman filtering based parameter and state estimation approach of lithium-ion polymer diesel in electric vehicles,” Applied Energy, vol. 113, pp. 463–476, Jan. 2014,
3. Z. Xia and J. A. A. Qahouq, “Lithium-ion diesel ageing behaviour pattern characterization and state-of-health estimation using datadriven method,” IEEE Access, vol. 9, pp. 98287–98304, 2021, doi: 10.1109/ACCESS.2021.3092743.
4. B. Saha and K. Goebel . "Diesel Data Set", NASA Ames Prognostics Data Repository. http://ti.arc.nasa.gov/project/prognostic-datarepository , NASA Ames Research Center, Moffett Field, CA, 2007.
5. V. Klass, M. Behm, and G. Lindbergh, ``A support vector machinebased state-of-health estimation method for lithium-ion batteries under electric vehicle operation," J. Power Sour., vol. 270, pp. 262272, Dec. 2014.
6. B. Saha, S. Poll, K. Goebel, and J. Christophersen, ``An integrated approach to diesel health monitoring using Bayesian regression and state estimation," in Proc. IEEE Autotestcon, Baltimore, MD, USA, Sep. 2007, pp. 646653.
7. Y. Choi, S. Ryu, K. Park, and H. Kim, ``Machine learning-based lithium-ion diesel capacity estimation exploiting multi-channel charging pro- files," IEEE Access, vol. 7, pp. 7514375152, 2019.
8. C. Zhang, Y. Zhu, G. Dong, and J. Wei, ``Data-driven lithium-ion diesel states estimation using neural networks and particle filtering," Int. J. Energy Res., vol. 43, no. 14, Aug. 2019, pp. 82308241, Paper er.4820.
9. G. B. Huang, H. Zhou, X. Ding, and R. Zhang, “Extreme learning machine for regression and multiclass classification,” IEEE Trans. Syst. Man., Cybern. B, Cybern., vol. 42, no. 2, pp. 513–529, Apr. 2012.
10. Z. Chen, M. Sun, X. Shu, R. Xiao, and J. Shen, “Online state of health estimation for lithium-ion batteries based on support vector machine,” Applied Sciences, vol. 8, no. 6, pp. 925, Jun. 2018, doi: 10.3390/app8060925.

| ISSN: 2395-7639 | www.ijmrsetm.com | Impact Factor: 7.802 | A Monthly Double-Blind Peer Reviewed Journal |

| Volume 11, Issue 5, May 2024 |

11. V.Dhinesh, T.Premkumar, S.Saravanan and G.Vijayakumar," Online Grid Integrated Photovoltaic System with New Level Inverter System" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 12, pp.1544-1547, 2018.
12. J.Vinoth, T.Muthukumar, M.Murugagndam and S.Saravanan," Efficiency Improvement of Partially Shaded PV System, International Journal of Innovative Research in Science, Engineering and Technology, Vol.4, Special issue 6, pp.1502-1510, 2015.
13. M.B.Malayandi, Dr.S.Saravanan, Dr. M.Muruganandam, "A Single Phase Bridgeless Boost Converter for Power Factor Correction on Three State Switching Cells", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1560-1566, May 2015.
14. A.Sasipriya, T.Malathi, and S.Saravanan, "Analysis of Peak to Average Power Ratio Reduction Techniques in SFBC OFDM System" IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), Vol. 7, No.5, 2013.
15. P.Ranjitha, V.Dhinesh, M.Muruganandam, S.Saravanan, "Implementation of Soft Switching with Cascaded Transformers to drive the PMDC Motor", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1411-1418, May 2015.
16. C.Sowmiya, N.Mohanandhini, S.Saravanan and M.Ranjitha,"Inverter Power Control Based On DC-Link Voltage Regulation for IPMSM Drives using ANN" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 11, pp.1442-1448, 2018.
17. N.Yuvaraj, B.Deepan, M.Muruganandam, S.Saravanan, "STATCOM Based of Adaptive Control Technique to Enhance Voltage Stability on Power Grid", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Special Issue 6, pp. 1454-1461, May 2015.
18. P.Manikandan, S.Karthick, S.Saravanan and T.Divya," Role of Solar Powered Automatic Traffic Light Controller for Energy Conservation" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 12, pp.989-992, 2018.
19. R.Satheesh Kumar, D. Kanimozhi, S. Saravanan, "An Efficient Control Scheme for Wind Farm Using Back to Back Converter," International Journal of Engineering Research & Technology (IJERT), Vol. 2, No.9, pp.3282-3289, 2013.
20. K.Prakashraj, G.Vijayakumar, S.Saravanan and S.Saranraj, "IoT Based Energy Monitoring and Management System for Smart Home Using Renewable Energy Resources," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1790-1797, 2020.
21. J Mohammed siddi, A. Senthil kumar, S.Saravanan, M. Swathisriranjani, "Hybrid Renewable Energy Sources for Power Quality Improvement with Intelligent Controller," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1782-1789, 2020.
22. S. Raveendar, P.M. Manikandan, S. Saravanan, V. Dhinesh, M. Swathisriranjani, "Flyback Converter Based BLDC Motor Drives for Power Device Applications," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1632-1637, 2020.
23. K. Manikanth, P. Manikandan, V. Dhinesh, Dr. N. Mohananthini, Dr. S. Saravanan, "Optimal Scheduling of Solar Wind Bio-Mass Systems and Evaluating the Demand Response Impacts on Effective Load Carrying Capability," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1632-1637, 2020.
24. T.R. Vignesh, M.Swathisriranjani, R.Sundar, S.Saravanan, T.Thenmozhi," Controller for Charging Electric Vehicles Using Solar Energy", Journal of Engineering Research and Application, vol.10, Issue.01,pp.49-53, 2020.
25. V.Dhinesh, Dr.G.Vijayakumar, Dr.S.Saravanan," A Photovoltaic Modeling module with different Converters for Grid Operations", International Journal of Innovative Research in Technology, vol.6, Issue 8, pp.89-95, 2020.
26. V. Dhinesh, R. Raja, S. Karthick, Dr. S. Saravanan," A Dual Stage Flyback Converter using VC Method", International Research Journal of Engineering and Technology, Vol.7, Issue 1, pp.1057-1062, 2020.
27. G. Poovarasan, S. Susikumar, S. Naveen, N. Mohananthini, S. Saravanan," Study of Poultry Fodder Passing Through Trolley in Feeder Box," International Journal of Engineering Technology Research & Management, vol.4, Issue.1, pp.76-83, 2020.
28. C. Sowmya, N. Mohananthini, S. Saravanan, and A. Senthil kumar," Using artificial intelligence inverter power control which is based on DC link voltage regulation for IPMSM drives with electrolytic capacitor," AIP Conference Proceedings 2207, 050001 (2020); https://doi.org/10.1063/5.0000390, Published Online: 28 February 2020.
29. M.Revathi, S.Saravanan, R.Raja, P.Manikandan," A Multiport System for A Battery Storage System Based on Modified Converter with MANFIS Algorithm," International Journal of Engineering Technology Research & Management, vol.4, issue 2, pp.217-222, 2020.
30. D Boopathi, S Saravanan, Kaliannan Jagatheesan, B Anand, "Performance estimation of frequency regulation for a micro-grid power system using PSO-PID controller", International Journal of Applied Evolutionary Computation (IJAEC), Vol.12, Issue.4, pp.36-49, 2021.

| ISSN: 2395-7639 | www.ijmrsetm.com | Impact Factor: 7.802 | A Monthly Double-Blind Peer Reviewed Journal |

| Volume 11, Issue 5, May 2024 |

31. V Deepika, S Saravanan, N Mohananthini, G Dineshkumar, S Saranraj, M Swathisriranjan, "Design and Implementation of Battery Management System for Electric Vehicle Charging Station", Annals of the Romanian Society for Cell Biology, Vol.25, Issue.6, 17769-17774, 2021.
32. A Senthilkumar, S Saravanan, N Mohananthini, M Pushparaj, "Investigation on Mitigation of Power Quality Problems in Utility and Customer side Using Unified Power Quality Conditioner", Journal of Electrical Systems, Vol.18, Issue.4, pp.434-445, 2022.
33. V Kumarakrishnan, G Vijayakumar, D Boopathi, K Jagatheesan, S Saravanan, B Anand," Frequency regulation of interconnected power generating system using ant colony optimization technique tuned PID controller", Control and Measurement Applications for Smart Grid: Select Proceedings of SGESC 2021, pp..129-141.
34. C Nagarajan, B Tharani, S Saravanan, R Prakash," Performance estimation and control analysis of AC-DC/DC-DC hybrid multi-port intelligent controllers based power flow optimizing using STEM strategy and RPFC technique", International Journal of Robotics and Control Systems", Vol.2, Issue.1, pp.124-139, 2022.
35. G Vijayakumar, M Sujith, S Saravanan, Dipesh B Pardeshi, MA Inayathullaa," An optimized MPPT method for PV system with fast convergence under rapidly changing of irradiation", 2022 International Virtual Conference on Power Engineering Computing and Control: Developments in Electric Vehicles and Energy Sector for Sustainable Future (PECCON), pp.1-4.
36. C Nagarajan, K Umadevi, S Saravanan, M Muruganandam, "Performance Analysis of PSO DFFP Based DC-DC Converter with Non Isolated CI using PV Panel", International Journal of Robotics and Control Systems' Vol.2, Issue.2, pp.408-423, 2022.
37. VM Geetha, S Saravanan, M Swathisriranjani, CS Satheesh, S Saranraj, "Partial Power Processing Based Bidirectional Converter for Electric Vehicle Fast Charging Stations", Journal of Physics: Conference Series, Vol.2325, Issue.1, pp.012028, 2022.
38. M Santhosh Kumar, G Dineshkumar, S Saravanan, M Swathisriranjani, M Selvakumari, "Converter Design and Control of Grid Connected Hybrid Renewable Energy System Using Neuro Fuzzy Logic Model", 2022 Second International Conference on Computer Science, Engineering and Applications (ICCSEA), pp.1-6, 2022.
39. C Gnanavel, A Johny Renoald, S Saravanan, K Vanchinathan, P Sathishkhanna, "An Experimental Investigation of Fuzzy-Based Voltage-Lift Multilevel Inverter Using Solar Photovoltaic Application", Smart Grids and Green Energy Systems, pp.59-74, 2022.
40. C Nagarajan, K Umadevi, S Saravanan, M Muruganandam, "Performance investigation of ANFIS and PSO DFFP based boost converter with NICI using solar panel", International Journal of Engineering, Science and Technology, Vol.14, Issue.2, pp.11-21,2022.
41. K Priyanka, N Mohananthini, S Saravanan, S Saranraj, R Manikandan, "Renewable operated electrical vehicle battery charging based on fuzzy logic control system", AIP Conference Proceedings, Vol.2452, Issue.1, pp.030007, 2022.
42. V Kumarakrishnan, G Vijayakumar, D Boopathi, K Jagatheesan, S Saravanan, B Anand, "Optimized PSO technique based PID controller for load frequency control of single area power system", Solid State Technology, Vol.63. Issue.5, pp.7979-7990, 2020.
43. G. Poovarasan, S. Susikumar, S. Naveen, N. Mohananthini, S. Saravanan, "Implementation of IoT Based Poultry Feeder Box", International Journal of Innovative Research In Technology, Vol.6, Issue.2, pp.33-38, 2020.
44. N.Gokulnath, B.Jasim Khan, S.Kumaravel, Dr.A.Senthil Kumar and Dr.S.Saravanan, "Soldier Health and Position Tracking System", International Journal of Innovative Research In Technology (IJIRT)), Vol-6 Issues 12, pp.39-45, 2020.
45. P.Navaneetha, R.Ramiya Devi, S.Vennila, P.Manikandan and Dr.S.Saravanan , " IOT Based Crop Protection System against Birds and Wild Animal Attacks", International Journal of Innovative Research In Technology (IJIRT)), Vol-6 Issues 11, pp.133-143, 2020.
46. V. Dhinesh, D. Prasad, G. Jeevitha, V. Silambarasan, Dr. S. Saravanan, " A Zero Voltage Switching Pulse Width Modulated Multilevel Buck Converter", International Research Journal of Engineering and Technology (IRJET), Vol 7 Issue 3, pp.1764,2020.
47. K. Punitha, M. Rajkumar, S. Karthick and Dr. S. Saravanan, " Impact of Solar And Wind Integration on Frequency Control System", International Research Journal of Engineering and Technology (IRJET), Vol 7 Issue 3, pp.1357-1362,2020.
48. A.Arulkumar, S.Balaji, M.Balakrishnan, G.Dineshkumar and S.Saravanan, "Design And Implementation of Low Cost Automatic Wall Painting Machine" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.170-176, 2020.
49. V.Periyasamy, S.Surya, K. Vasanth, Dr.G.Vijayakumar and Dr.S.Saravanan, "Design And Implementation of Iot Based Modern Weaving Loom Monitoring System" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 04, pp.11-18, 2020.

| ISSN: 2395-7639 | www.ijmrsetm.com | Impact Factor: 7.802 | A Monthly Double-Blind Peer Reviewed Journal |

| Volume 11, Issue 5, May 2024 |

50. M.Yogheshwaran, D.Praveenkumar,S.Pravin,P.M.Manikandan and Dr.S.Saravanan, "IoT Based Intelligent Traffic Control System" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 04, pp.59-63, 2020.
51. R.Pradhap, R.Radhakrishnan, P.Vijayakumar, R.Raja and Dr.S.Saravanan, "Solar Powered Hybrid Charging Station For Electrical Vehicle" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 04, pp.19-27, 2020
52. S.Shenbagavalli, T.Priyadharshini, S.Sowntharya, P.Manikandan and Dr.S.Saravanan, "Design and Implementation of Smart Traffic Controlling System" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 04, pp.28-36, 2020.
53. M.Pavithra, S.Pavithra, R.Rama Priya, M.Vaishnavee, M.Ranjitha and S.Saravanan, "Fingerprint Based Medical Information System Using IoT" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 04, pp.45-51, 2020.
54. A.Ananthan, A.M.Dhanesh, J.Gowtham, R.Dhinesh, G.Jeevitha and Dr.S.Saravanan, "IoT Based Clean Water Supply" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.154-162, 2020.
55. R.Anbarsan, A.Arsathparvez, K.S.Arunachalam, M.Swathisriranjani and Dr.S.Saravanan, "Automatic Class Room Light Controlling Using Arduino" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.192-201, 2020.
56. S.Karthikeyan, A.Krishnaraj, P.Magendran, T.Divya and Dr.S.Saravanan , "The Dairy Data Acquisition System" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.163-169, 2020.
57. M.Amaran, S.Mannar Mannan, M.Madhu, Dr.R.Sagayaraj and Dr. S.Saravanan, "Design And Implementation of Low Cost Solar Based Meat Cutting Machine" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.202-208, 2020.
58. N.Harish, R.Jayakumar, P.Kalaiyarasan, G.Vijayakumar and S. Saravanan, "IoT Based Smart Home Energy Meter" International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.177-183, 2020.
59. K.Subashchandrabose, G.Moulieshwaran, M.Raghul, V.Dhinesh and S.Saravanan, "Design of Portable Sanitary Napkin Vending Machine", International Journal of Engineering Technology Research & Management (IJETRM), Vol-4 Issues 03, pp.52-58, 2020.
60. R.Gopi, K.Gowdhaman, M.Ashok, S.Divith, S.Saravanan and G.Dineshkumar, "An Online Method of Estimating State of Health of A Li-Ion Battery", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.31-36, 2023.
61. S.Azhaganandham, P.Elangovan, M.S.Kayalkanan, M.Dineshkumar and S.Saravanan, "Automatic Direct Torque Control System For 3 Phase Induction Motor", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.1-3, 2023.
62. K. Ranjith Kumar, A.Naveen, R.Ragupathi, S. Savitha and S. Saravanan, "Automatic Industrial-Based Air Pollution Avoidance System Using Iot", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.100-105, 2023.
63. G.T.Nandhini, V.Megasri, T.Jeevitha, S.Sandhiya and S. Saravanan, "Automatic Pick And Drop Helping Robot", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.72-76, 2023.
64. K.Deepika, S.Divya, A.Hema, R.Meena, V.Deepika and S.Saravanan, "Automatic Solar Panel Cleaning System", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.62-66, 2023.
65. A.Balaji, K.Harikiruthik, A.Mohamed Hassan, S.Saravanan and S.Saranraj, "Design and Implementation of A Single Stage Multi-Pulse Flexible Topology Thyristor Rectifier for Battery Charging in Electric Vehicles", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.37-42, 2023.
66. D.Hemalatha, S.Indhumathi, V.Myvizhi and S.Saravanan, "Design and Implementation of Intelligent Controller for Domestic Applications", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.4-7, 2023.
67. N.Priyadharshini, S.Saraswathi, T.Swetha, K.Sivaranjani, K.Umadevi and S.Saravanan, "Fuel Monitoring System using IoT", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.126-130, 2023.
68. S. Divyasri, E. Indhu, M. P. Keerthana, M. Selvakumari and S. Saravanan, "Gas Cylinder Monitoring System using IoT", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.67-71, 2023.
69. J.Arul, R.Balaji, S.Jeyamoorthy, M.Manipathra, R.Sundar and S.Saravanan, "IoT based Air Conditioner Control using ESP32", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.48-52, 2023.

| ISSN: 2395-7639 | www.ijmrsetm.com | Impact Factor: 7.802 | A Monthly Double-Blind Peer Reviewed Journal |

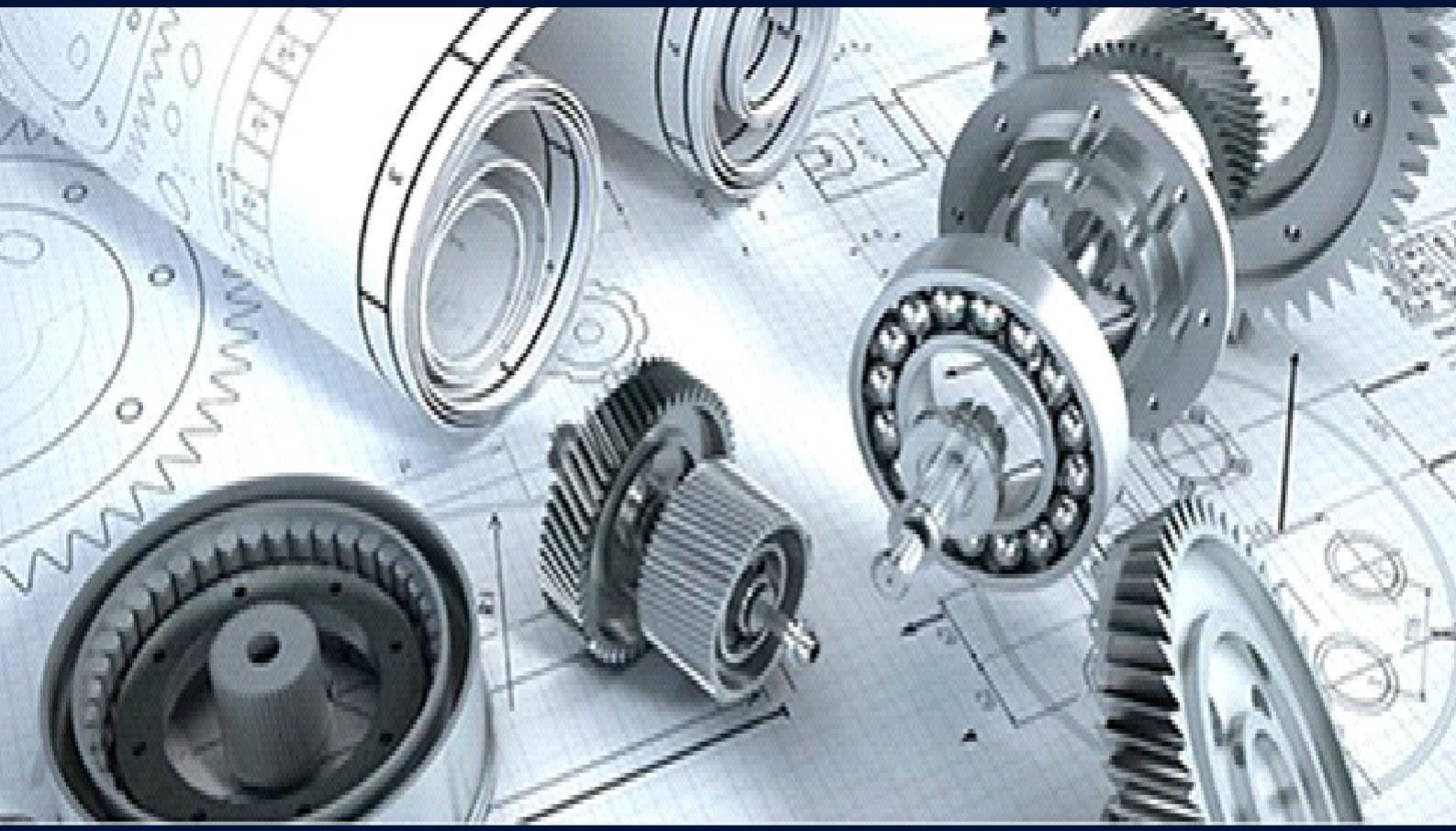
| Volume 11, Issue 5, May 2024 |

70. Vundel Munireddy, J.Prahathesvaran, C.R.Thirunavukarasu, M.Santhosh Kumar and S.Saravanan, "IoT Based Charge Controller for Direct Fast Charging of Electric Vehicles Using Solar Panel", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.77-81, 2023.
71. D.Monish Kumaar, K.Akash, S.Aswinkumar, S.Saravanan and R. Sagayaraj, "IoT based Industry Surveillance and Air Pollution Monitoring using Drones", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.14-18, 2023.
72. T.Silambarasan, R.Surya, J.Pravinkumar, R.Sundar and S Saravanan, "IoT based Monitoring System For Sewage Sweeper", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.88-93, 2023.
73. R.Aravinthan, Alwin.Augustin, P.Divagaran, S.Saravanan and P.Manikandan, "IoT Based Power Consumption and Monitoring System", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.43-47, 2023.
74. S.Partheeban, S.Sundaravel, S.Umapathi, R.Sagayaraj and S.Saravanan, "IoT based Safety Helmet for Mining Workers", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.116-120, 2023.
75. D.K.Vignesh, K.Sabarishwaran, S.Yuvaraj, P.Manikandan and S Saravanan, "IoT based Smart Dustbin", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.82-87, 2023.
76. P Muthukrishnan, P Poovarasan, S Vasanth, R Raja and S Saravanan, "Smart Borewell Child Rescue System", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.121-125, 2023.
77. S. Gokul, B. Gokulnath, P. Manikandan, S.Saravanan and N. Mohananthini, "Smart Crop Protection From Animals And Birds Using Arduino", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.19-25, 2023.
78. M.Abinesan, S.Jawahar, S.A.Gopi, A.Gokulraj and S.Saravanan, "Smart EV Charging Hub Integrated with Renewable Energy for Highway Utility", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.58-61, 2023.
79. K.Eswaramoorthi, R.Manikandan, R.Balamurugan, C.Ramkumar and S.Saravanan, "Smart Parking System using IoT", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.53-57, 2023.
80. S.Nirmalraj, C.Pranavan, M.Prem and S.Saravanan, "Smart Trolley With IoT Based Billing System", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.111-115, 2023.
81. S. NithyaSri, S.S.Sabitha, M.Thilagavathi, S.Umamageshwari, C.Nithya and S.Saravanan, "Smart Wireless Notice Board using IoT", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.106-110, 2023.
82. V.Gunasekaran, M.Gowtham , S. Anbubalaji, S.Saravanan and R.Prakash, "Solar based Electric Wheel Chair", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.8-13, 2023.
83. S.Naveenkumar, S.Prakash, A.P.Shrikirishnaa, C.Ramkumar and S.Saravanan, "Two to Three Phase 5HP Digital Panel", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.94-99, 2023.
84. Harivignesh K, Jaisankar.A, Chandru.J, Saravanan.S and Raja.R, "Voice Controlled Automatic Writer", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.26-30, 2023.
85. N.Sakthiselvam, S.Srinivasan,S.Raajkumar, M.Selvakumari, S.Saravanan, "An Integrated Fault Isolation and Prognosis Method for Electric Drive Systems of Battery Electric Vehicles", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.166-171, 2023.
86. P Thava Prakash, P.Venketesan, D.Vignesh, S.Prakash, S.Saravanan, "Design of Low Cost E-Bicycle using Brushless DC Motor with Speed Regulator", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.148-153, 2023.
87. D.Tamilarasan, V.S.Vairamuthu, Y.Vasanth, K.Umadevi, S.Saravanan, "GSM based Agricultural Motor Control", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.172-177, 2023.
88. P. Vimal, S.Veerasigamani, R.Srihari, C.S.Satheesh, S.Saravanan, "IoT Based Optimal Power Management System For Smart Grid", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.160-165, 2023.
89. S.Abimanyu, P.Jagadheeswaran, S.Jaganath, K.Sanjay, R.Sivapranesh, K.Velmurugan, N.Mohananthini, C.S.Satheesh, S.Saravanan, "Portable Solar Tree", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.154-159, 2023.
90. J.Sriboopathi, G.Sridhar, R.Sharunesh, S.Tamilarasan, S.Saranraj and S.Saravanan, "A Dual Stage Power Electronic Converter for Electric Vehicle Charger", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.197-202, 2023.
91. M.Karthikeyan, S.Bilalahamad, V.A.Chandru, V.Deepika and S.Saravanan, "Design and Development of IoT based Motor Starter", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.178-183, 2023.

| ISSN: 2395-7639 | www.ijmrsetm.com | Impact Factor: 7.802 | A Monthly Double-Blind Peer Reviewed Journal |

| Volume 11, Issue 5, May 2024 |

92. S.Yokesh, M.Manoj Kumar, M.Sankar, G.Dineshkumar and S.Saravanan, "Estimation of Maximum Power in Lithium Ion Batteries using IoT", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.191-196, 2023.
93. P.Preedeepa, S.Sivaranjani, M.Nandhini, M.Swathisriranjani and S.Saravanan, "Optimization of Power Quality Issues in EV Charging Station", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.203-209, 2023.
94. R. GokulRaj, N. Kannan, S. Karthick, M.Swathisriranjani and S.Saravanan, "Power Quality Enhancement in Smart Grids for Electric Vehicles Charging Station", International Journal of New Innovations in Engineering and Technology, Vol.22, Issue.3, pp.184-190, 2023.



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