Power Quality Enhancement in Smart Grids for Electric Vehicles Charging Station

R. GokulRaj [1], N. Kannan[2], S. Karthick[3], M.Swathisriranjani [4], S.Saravanan[5]
UG scholars[123], Assistant professor[4], professor[5]
Department of Electrical and Electronics Engineering,Muthayammal Engineering College -Tamil Nadu

Abstract— The global warming problem together with the environmental issues has already pushed the governments to replace the conventional fossil-fuel vehicles with electric vehicles (EVs) having less emission This project describes the power quality improvement of STATCOM on thedistribution of the system To improve the power quality of the system STATCOM and active power filter is placed on the grid connected system for improve the power quality of the system This replacement has led to adding a huge number of EVs with the capability of connecting to the grid. It is noted that the presence of such vehicles may introduce several challenges to the electrical grid due to their grid to-vehicle and vehicle-to-grid capabilities. In between, the power quality issues would be the main items in electrical grids highly impacted by such vehicles. Thus, this study is devoted to investigating and reviewing the challenges brought to the electrical networks by EVs. In this regard, the current and future conditions of EVs along with the recent research works made into the issue of EVs have been discussed in this study. Accordingly, the problems due to the connection of EVs to the electrical grid havebeen discussed, and some solutions have been proposed to deal with these challenges.

Keywords— Electric Vehicles, Power Quality, Electric Power Transmission Networks, Secondary Batteries, Smart Power Grids, Hybrid Vehicles, Power Electronics.

I. INTRODUCTION

The Address climate change exploiting electric vehicles (EVs) instead of fossil-fuel counter parts has been considered as one of the main solutions combatting the increase of greenhouse gas emissions from the grid point of view; seemingly, such vehicles are treated as new loads to be fed. In this context, the distribution system operators (DSOs) have encountered several grid-operation challenges like line capacity, voltage instability and voltage fluctuations and system harmonic. To tackle loading issues, grid line reinforcement is the long-lasting solution but the expensive one. Thanks to the controllability feature of EV battery inverters, however, these new grid inhabitants can be treated as active elements which can contribute towards improving the quality of the power system. With growing numbers of electric vehicles (EV) and hybrid electric vehicles (HEV), they become a part of the utility grid. EV/HEV consumer role is changing to the smart consumer role, or so-called prosumer (combined producer and consumer device). Additionally, there is the possibility to use EV/HEV as a smart producer for power quality improvement ingrid. The scheme suggested in this paper can be used as static synchronous compensator (STATCOM) as the part of traction system of the EV/HEV. Fast acting STATCOM is a part of flexible AC transmission systems (FACT) device family. STATCOM is a promising technology being extensively used as the state-of-the-art dynamic shunt compensator for power quality improvements, reactive power control, voltage regulation, power swings/oscillations damping, damping torsional oscillations sub-ynchronous resonance damping, transmission line capacity enhancement, dynamic stability improvement including steady state, transient and voltage stability, and for application under power system faults.

II. EXISTING SYSTEM

In existing system electric vehicle charging applications has been applied for charge of EV system traditional voltage regulator-based algorithm has been implemented in existing system. An electric vehicle charger converts the AC current from the grid into a constant DC current to charge the batteries. From the grid, the EV, therefore, is often seen as a constant current source regulator-based scheme has been implemented for charge our electric vehicle system grid through an SAE J1772 charging station, a pilot signal is supplied to the EV from the station that tells what the maximum AC current draw is from that connection point.

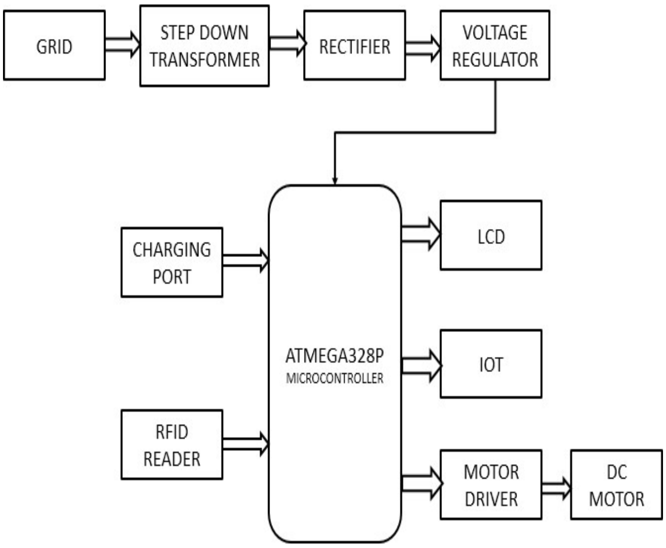
The EV charges at that current unless the battery management system reduces the maximum current draw to improve battery life near the end of the charging cycle, or if the EV charger cannot handle that high current level. The proposed voltage-based controller adjusts this EV charging current, and therefore the charging load, based on the AC voltage observed at the point of connection. The direct objective of the EV battery charging control is to maintain the distribution system nodal voltages within acceptable limits. This will ensure that the feeder losses are reduced and overloads are avoided. At a given distribution transformer, the load is the composition of controllable and non-controllable loads. Since the voltage profile of the system is a function of its loading levels, the voltage profile can be significantly enhanced by controlling the load. In this work, the only controllable loads considered are the EV control structure, the feedback signal that is used as an input for the controller is the voltage at the point of charging (POC). The controller output is the regulated charging rate, or the charger current draw (ID_i). Since unidirectional power flow is assumed, the charging current minimum limit is zero and its maximum limit is taken from the EV charger specifications or the maximum rating of the charging station, whichever is lower. For each EV, based on the POC voltage and the EV battery SOC, the controller decides on the regulated charging current. An electric vehicle (EV) charge-discharge management framework for theeffective utilization of photovoltaic (PV) output through coordination based on information exchange between home energy management system (HEMS) and grid energy management system (GEMS). In our proposed framework, the HEMS determines an EV charge discharge plan for reducing the residential operation cost and PV curtailment without disturbing EV usage for driving, on the basis of voltage constraint information in the grid provided by the GEMS and forecasted power profiles. Then, the HEMS controls the EV charge-discharge according to the determined plan and real-time monitored data, which is utilized for mitigating the negative effect caused by forecast errors of power profiles. The proposed framework was evaluated on the basis of the Japanese distribution system simulation model. The simulation results show the effectiveness of our proposed framework from the viewpoint of reduction ofthe residential operation cost and PV curtailment.

In is proposed an autonomous distributed vehicle-to-grid control scheme, and in is presented a coordinated charging of multiple PHEVs in residential distribution grids. The integration of EVs in the electrical grid, describing technical solutions is present. Uncoordinated Charging: from the moment which the vehicle is plugged into the electrical grid the charging can starts immediately or after a fixed time delay (controlled by the user). With this uncoordinated charging the power consumption (due to the large number of EV to charge) will be great and will bring problems to theelectrical grid. The discharging of the batteries directly to the electrical power grid is made without the performances of the coordinated charging. An electric vehicle (EV) charge-discharge management framework for theeffective utilization of photovoltaic (PV) output through coordination based on information exchange between home energy management system (HEMS) and grid energy management system (GEMS). In our proposed framework, the HEMS determines an EV charge discharge plan for reducing the residential operation cost and PV curtailment without disturbing EV usage for driving, on the basis of voltage constraint information in the grid provided by the GEMS and forecasted power profiles. Then, the HEMS controls the EV charge-discharge according to the determined plan and real-time monitored data, which is utilized for mitigating the negative effect causedby forecast errors of power profiles.

III. PROPOSED SYSTEM

The proposed system power quality improvement of electric vehicle using STATCOM on these devices PQ improvement in the smart grid using EVs One of the main conventional techniques to improve the grid's capability to provide a clean and stable supply to the end-users is to adopt Volt-VAR components. These components include transformers with on-load tap changers (OLTCs), voltage regulators (VRs), capacitor banks (CBs), as well as other industrial Volt-VAR control components in distribution grid. STATCOM implemented in distribution networks are known as 'D- STATCOM'. D-STATCOM has the advantage that they can inject almost sinusoidal three-phase balanced current. D-STATCOMs are characterized as reactive output power (capacitive or inductive) only compensators.

Design concept of D-STATCOM and is explained below based on power flow relationship. D-STATCOM as a dynamic model is based on the Milano method. For brevity,the only equations used are presented in it. A detailed and simplified modelling of D- STATCOM is comprehensively discussed. The detailed model of D-STATCOM mainly consists of three parts: the DC network, the voltage source converter, and the associated controllers. Harmonics the rise in high frequency components of voltage and current with compared to fundamental frequency is defined as harmonics. Harmonics distorts the voltage & current waveforms and thereby affecting power quality. It can be measuredby total harmonic distortion (THD) of current & voltage. Basically, the power quality is affected by the non-linear current consumption of some loads, i.e. The THD of this current. The main problems in power quality are: harmonics; noise (electromagnetic interference); inter-harmonics; momentary interruption; sag; swell; flicker; notches; and transients. As way to resolvethese problems are used active power filters as: Shunt Active Power Filters; Series Active Power Filters; and Unified Power Quality Conditioner. In literature several papers already were presented related with the power quality and the grid. In the particular case of Portugal, in is analyzed the impact of PHEVs in the electric utility system, where, basically is approached the Portuguese consumption profile. Several scenarios of PHEVs penetration are studied considering the concept Grid-for-Vehicle (G4V) (transference of energy from grid to vehicle) as first approach. The impacts of battery charging rates of EVs on Smart Grid distribution systems are approached. For this goal were compared charging rates, different charging periods along a day, wereconsidered the existing system load profiles, and was evaluated the overall performance of the electrical distribution system.



V. HARDWARE RESULT AND DISCUSSION

The smart charging EV system simulation to run the project. To explain thevehicle of dc motor are running condition and not charging condition. We see an LCD view of the charging units and time, as well as an IoT virtual terminal view of the charging unit and quantity. The dc motor is not in operation. This number also describes the charging status and charging minutes as shown on theLCD and IOT displayed to the charging unit, as well as the quantity. Please check all figures in your paper both on screen and on a black-and-white hardcopy.

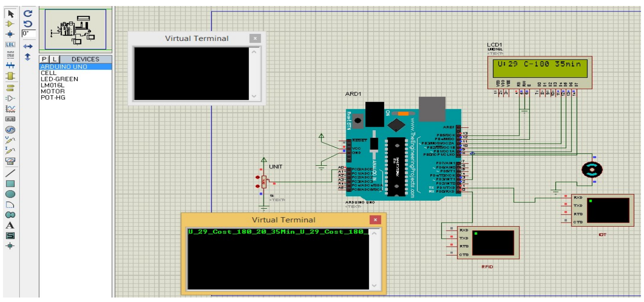


Fig 2 Hardware simulation result

Fig 3 Output Waveform

The main problems in power quality are harmonics, noise, electromagnetic interference, inter- harmonics, momentary interruption, sag, swell, flicker, notches and transients. In literature survey several works used filters such as Shunt Active Power Filters, Series Active Power Filters and Unified Power Quality Conditioner for minimizing power quality problems. In this project, the power quality can be improved by using the pulse width modulator (PWM). The variation of power quality is optimized and control unit used to charge the Electric vehicle.

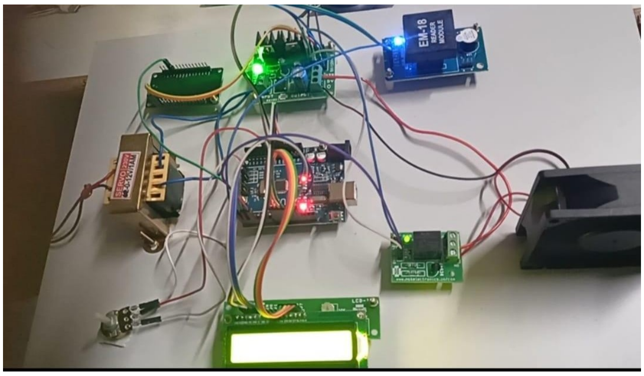


Fig 4 Hardware result

VI. CONCLUSION

The challenge regarding the PQ improvements could be studied in system level and end-user level. Consequently, a multi-layer communication-enhanced infrastructure is required to realize the coordination between the key players. The first layer handles the coordination between the system operator and the EV aggregators for dispatching active/ reactive power by sending charging/discharging commands (system level improvements). The second layer manages the coordination between end-users (EV owners) and the EV aggregator units (end-user improvements) for PQ improvements in LV networks. As discussed in Section 6, both modern and conventional communication systems are required to connect different layers. The main challenge in PQ improvement is to develop EV chargers that operate as multifunctional four-quadrant STATCOM and an APF to simultaneously cover active/reactive power injection and harmonic reduction.

REFERENCES

[1] 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.

[2] 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.

[3] 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.

[4] 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.

[5] 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.

[6] 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.

[7] 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.

[8] 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.

[9] 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.

[10] 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.

[11] 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.

[12] 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.

[13] 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.

[14] 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.

[15] 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.

[16] 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.

[17] 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.

[18] 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.

[19] 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.

[20] 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.

[21] 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.

[22] 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.

[23] 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.

[24] 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.

[25] 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.

[26] 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.

[27] 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.

[28] 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.

[29] 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.

[30] 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.

[31] 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.

[32] 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.

[33] 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.

[34] 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.

[35] 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.

[36] 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.
[37] 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.
[38] 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.
[39] 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.
[40] 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.
[41] 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
[42] 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.
[43] 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.
[44] 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.
[45] 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.
[46] 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.
[47] 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.
[48] 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.
[49] 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.
[50] 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.
[51] 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.
[52] 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.
[53] 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.
[54] 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.
[55] 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.
[56] 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.
[57] 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.
[58] 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.
[59] 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.
[60] 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.
[61] 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.
[62] 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.
[63] 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.
[64] 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.
[65] 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.
[66] 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.
[67] 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.
[68] 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.
[69] 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.

[70] 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.
[71] 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.
[72] 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.
[73] 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.
[74] 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.
[75] 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.
[76] 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.
[77] 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.
[78] 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.
[79] 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.