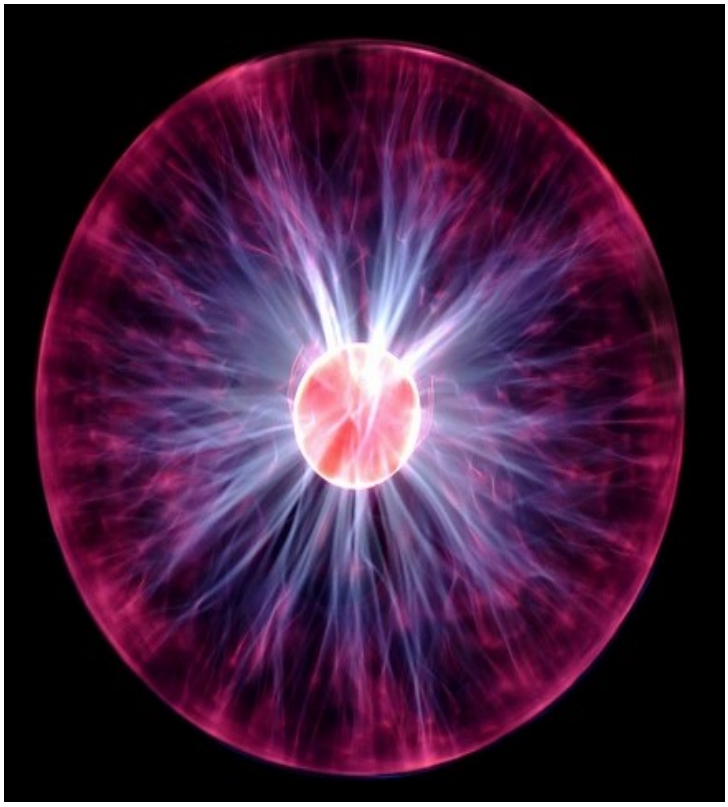
Academic Year :
2021 - 2022



ELECTROSPHERE

---- A Technical Magazine

Department of Electrical Engineering
AISSMS 's Institute of Information Technology, Pune.

Volume V

INDEX

About Department of Electrical Engineering

The Department of Electrical Engineering was established in 1999 at AISSMS, Institute of Information Technology, Pune. The department offers **B.E. in Electrical** and **M.E.in Power Electronics and Drives**. The department currently has 13 professional faculties, including 02 IEEE, 11 IE(I) and 13 ISTE members. In the department, near about 30 courses are offered, encompassing all areas of electrical engineering. Faculty and students are engaged in courses and research in the fields viz; power systems, control systems, power electronics, electrical machines, renewable systems and power quality. The department focuses on developing its strengths and aligning with the institutional priorities of IOIT.

The vision of the department is to contribute to the society by imparting quality education in the field of electrical engineering and prepares students to succeed in their professional career by inculcating in them high human values.

The department's mission is to develop innovative and socially responsible engineering professionals by delivering in-depth knowledge of electrical engineering.

Several small, medium and large projects have been sanctioned to department faculty in the last five years. This has led to the development of center of excellence in power quality.

Department faculty has been traditionally contributing to administrative activities both within and outside the Institute. Currently, 10 faculties are serving as chairman/paper setter/examiner at University. Several faculties from the department are currently serving as coordinators within the Institute.

The department endeavors to produce confident professionals tuned to real time working environment. Department Alumni have made excellent contributions in various fields like entrepreneurship, industry, and academics. A few illustrious who have distinguished themselves are Kalyani Abhyankar (Sr. Operations Engineer, Sacramento, California Area), Ruchi Muku Das (Infrastructure and Network Procurement, Unilever Asia Pvt. Ltd), Amol Manal (Controls Specialist at Lorik Tool & Automation Kitchener, Ontario, Canada) , Vishakha Chandhere (Founder, OrjaBox Pune, Maharashtra) , Lalit Ghatpande (Relay Setting Engineer, Synchro Grid Limited LLC).

The infrastructure and lab facilities are upgraded from time to time and provide a good practical learning and innovative environment for the students and researchers. There are about 07 laboratories just for the exclusive benefit of students of department of EE.
The department strives to provide a conductive environment for the students to develop analytical and practical skills and apply them to real world problems. To motivate the students, the department organizes regular training workshop.

A competitive environment is fostered and development of leadership skills and team skills are also encouraged by means of the department professional body societies such as IEI, IEEE, ISTE, ISLE, REC, EESA which holds various co-curricular and extracurricular events, contests from time to time to bring out hidden talents.

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Dr. S. M. Bakre	Mr. S V. Shelar	Mr. S.M.Chaudhari	Mrs. K.S. Gadgil
			
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Mrs. V.P. Kuralkar	Mr. P.P. Mahajan	Mrs. S.N. Powniker	Mr. S.D. Raste

Electrical Department Faculty Members

Technical Articles

Transparent Solar PV Technology

The new horizon in Renewable Energy Systems

The demand for electric power is increasing exponentially in India from 1362 MW in the year 1947 to 382 GW as of today. This brings out lot of stress on conventional generation particularly coal. Incidentally the world is facing electricity crises as the stocks of coal are limited. Therefore efforts have being done to enhance the installed capacity of Renewable Energy Sources. At present the ratio of conventional to non-conventional generation capacity is about 75:25%. Under non-conventional energy systems, the solar generation has a major stake. About 42% generation is solar out of the total Renewable Energy Systems. There are however certain problems associated with existing solar generation systems. These problems have been discussed in this article. These problems can be tackled by use of Transparent Photovoltaic (TPV) cells. In his article, the comparative benefits of transparent solar cells are described. The applications of TPV cell systems in various areas are discussed. The basic construction and working of TPV cells are also explained.

Introduction

Over a period of time the energy needs are growing exponentially in India. In the year 1947, when the nation got freedom, the installed generation capacity in India was about 1362 MW. As of today, the total installed power generation capacity in April 2021 was around 382 GW which is contributed by Coal (209 GW), Hydro (46 GW), Nuclear (6.5 GW), Gas (25 GW), Diesel (0.5 GW) and Renewable Energy Systems (RES) (95 GW) (Source- Central Electricity Authority, New Delhi). Thus, the renewable energy contributes to 24.87% of the total installed capacity. Out of 95GW, the solar generation has a share of around 40 GW which is 42 % of the total RES. The conventional generation, coal in particular, comes with number of problems such as reducing stocks of coal day by day, pollution due to ash and carbon particles and delay in starting plant. Incidentally the world is facing coal crises today which may result into blackouts in certain areas. In contrast, the non-conventional generation offers number of benefits such as zero or low cost of fuel, lesser capital cost, abundant availability of fuel and sustainable development. As seen from above the solar energy has a major stake among the available RES. There are, however, certain problems with conventional solar generation because of which, the concept of TransparentPhotovoltaic (TPV) cells has been emerged.

The TPV Technology

The incident sunlight comprises of visible rays, ultraviolet rays and infrared rays. As the visual rays provide visibility, our eyes can visualize objects. On the other hand, the ultraviolet and Near Infra-Red (NIR) rays are harmful to our eyes. The conventional non-transparent cells cannot absorb the ultraviolet and NIR rays whereas the transparent solar PV are capable of observing these rays and also produce electricity. Thus, the visual rays pass through transparent solar PVCells.

- Furthermore, there are space constraints. The conventional non-transparent solar panels require vast area of land or rooftop. Thus,the electricity can be generated at the cost of land is required to be dedicated for the purpose ofgeneration. This can be seen from the present installations of conventional non-transparent solar panels.
- The Transparent solar panels can be placed at number of locations. These can be used in buildings, vehicles, mobile phones and other electronic devices. The buildings having glass windows can be replaced by those having transparent solar PV cells embedded inside. On similar lines, the glasses provided on vehicles and mobile phone screens can be replaced by transparent solar PVcells. The mobile phones can be auto-charged using the transparent photovoltaic solar cells. Figure 1 shows applications of transparent PV technology in buildings, vehicles and mobile phones.

The significant features of the transparent photovoltaic cell system are discussed below-

Figure 1: Various applications of transparent solar PV Cell technology

- Appearance of solar transparent solar PV system is just like a normal transparent glass. It allows buildings to be energy self-sufficient. More than 25% of the power demand of the building can be fulfilled by providing transparent solar PV Cell systems.
- The transparent solar PV systems also prevent release of CO2 gas. It has optimized insulation and filter properties. It saves money and energy to itsusers.
- In fact, it is the only building material that pays for itself. The transparent solar PV systems integrate perfectly into buildings adapting to the design of each project.
- One TPV cell generates 0.5 volts. The rated current is in the range of 10 Amp to 15 Amp current. Thus, the cell generates a power of 5 watts to 7.5 watts. For example the solar panel comprising of 30 numbers of cells each having 3 Amp rating generates 15 Volts and 45 Watts power. The TPV solar array formed from the combination of 3 panels generates 45 Volts and 135 Watts of power.

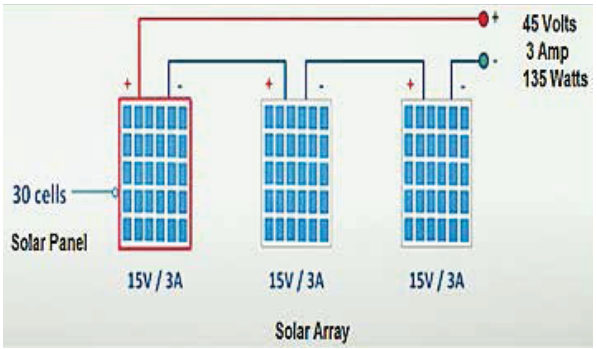

Figure 2:Formation of solar array

This is illustrated in Figure 2 wherein the Solar Array comprising of three solar panels and each panel is having 30 numbers of TPV cells.

The main component used in solar photovoltaic cell is crystalline silicon. Despite the advent of other materials such as two-dimensional substrates and organic compounds, crystalline silicon (c-si) remains the substrate of choice of solar cells with highest efficiencies. The c-si has much greater stability than other substrates. Figure 3 shows the photograph of TPVcells embedded in a glass.

Figure3: TPV Cell embedded in a glass

(Source Transparent solar cells | MIT Energy Initiative)

The glass appears as a normal glass and the presence of c-si cell cannot be identified. The light passing through the glass can be used as a visible light and also for generation of electricity. Unlike conventionally dark and opaque (non-transparent) solar cells, which absorb visible light, the TPVs make use of 'invisible' light.

As shown in Fig 4, the TPV cell allows only visible incident rays and blocks ultraviolet rays and near infrared rays. The visible light is used for visualization of objects and also for generation of electricity. Thus, the detrimental effects of UV and IR rays are avoided by blocking them. Around 70% of incoming light is converted to a useful visible light.

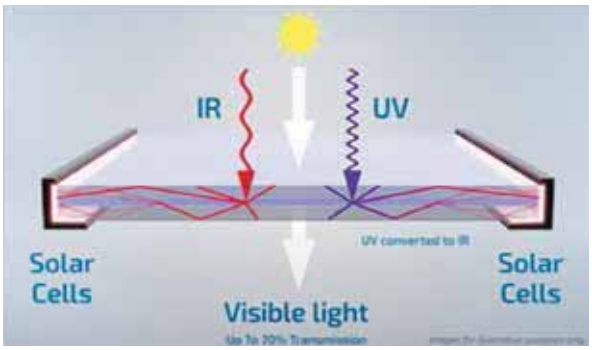

Figure 4: Components of sunlight- Visible, UV and NIR rays

(Source- Tech Unity)

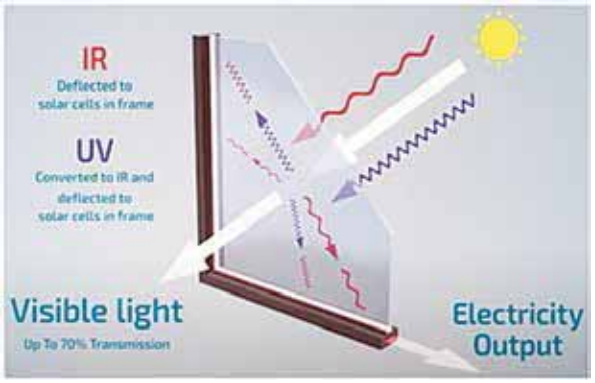

Figure 5: Visible light and Electrical output

(Source- Tech Unity)

As shown in Figure 5, the incoming sunlight is incident of the surface of the glass and about 70% of visible light is extracted from it. The balance 30% is undesired UV and near IR rays which is reflected over the surface of glass. The metal frame can be used as a busbar where the electrical output of the TPV cell is connected. Thus the output is available in two forms- light (i.e. visible light)and electricity. Figure 6 depicts busbars where the electrical output of the PV cell is connected.

Figure 6: Frames of glass as bus bars.

(Source Solar Windows Technologies Inc.)

If the suitable electrical load is connected to the bus bar, it will be catered electric supply through the TPV cell system. For instance, the lamp load is connected at the bus bar and the lamp is illuminated. The setup is furnished in figure 7.

Figure7: Lamp illumination through TPV

(Source- Solar Windows Technologies Inc)

In this way the solar TPV caters electrical supply to number of smaller electrical loads.

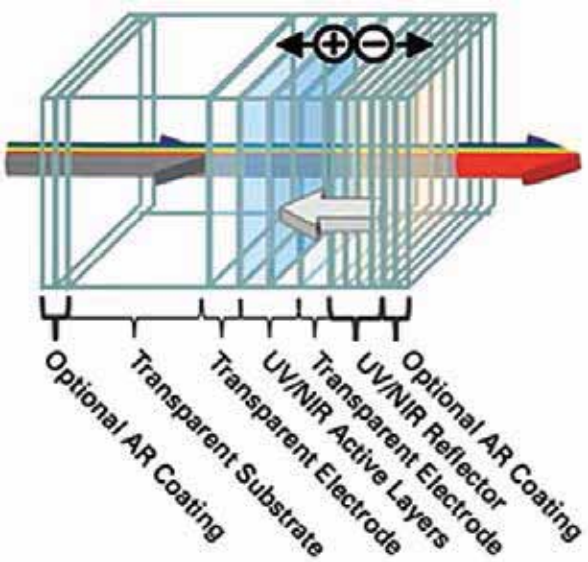

Figure8: Schematic of solar transparent solar PV Cell

(Source Transparent solar cells | MIT Energy Initiative)

Figure8 shows the schematic diagram of the transparent solar PV Cell indicating main components. As mentioned above, the transparent solar PV cell transmits visible rays and captures Ultraviolet (UV) and Near Infrared Rays (NIR). The PV coating (AR coating) comprising of series of thin layers is deposited on the piece of glass, plastic or other transparent substrate. This coating provided at extreme left absorbs UV/NIR rays and it allows current to flow across transparent electrodes through the external circuit. The UV/NIR rays are reflected back to UV/NIR active layers through the reflectors. The transparent electrodes sandwich the two layers. The layers comprise of absorptive semiconductor materials. This semiconductor material gets excited by the sunlight. The interaction of semiconductor and sunlight results in creation of the electric field. Due to electric field the current starts flowing. As the layers are connected to transparent electrodes, the current flows through these electrodes and then to the external electric circuit. It is essential that the electrodes are transparent and not reflective in nature. The UV and NIR rays have a particular wavelength. The rays of such wavelength are reflected back by UV/NIR reflectors. Finally the Anti-Reflective (AR) coatings are provided on both ends of outside surfaces to reduce reflection of sunlight. Although the use of such coatings is optional, it is recommended to provide these layers at both the outside surfaces of the cell because 10% of total sunlight is likely to be reflected. In this way, the AR Coating provided outside the surface of the cell reduces reflections so as to allow maximum amount of light to enter.

Now let us understand the operation of solar cells. The absorptive response of transparent solar PV cell is measured and compared with conventional cells. This is illustrated in Fig 9 (a and b). The dark black curve shows the absorptive response superimposed on solar spectrum shown by a faint curve. Fig 9(a) shows response of conventional solar cell whereas Fig9(b) shows that of transparent solar PVcell.In the conventional cell shown in Fig 9(a), the wavelengths at which absorption is relatively high include the visible part of the spectrum. This visible part can be detected by our eyes. It is between 400 and 700 nanometers approximately. On other hand, the transparent solar PV cell absorbs well in UV and NIR portions of the spectrum both above and below the visible range asshowninFig9(b).However,invisibleregiontheabsorptionisnearlynegligible.

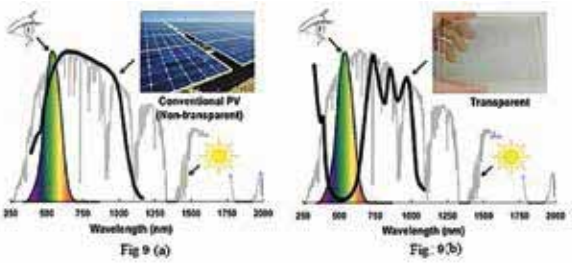

Figure 9: Absorptive response of PV cells

(Source Transparent solar cells | MIT Energy Initiative)

The critically placed gap makes the MIT solar cell transparent to the human eye, but it also means that the cell does not capture all the incident sunlight. The current versions of the transparent solar PV cells transmit more than 70% of the visible light, which is within the range of tinted glass now used in the windows of buildings. But their power-conversion efficiency is lesser, about 12%. There is a challenge to researchers to enhance the power conversionefficiency.

The merits and demerits of using transparent solar PV cells are summarized as follows-

Merits

- Noextral and orspaceon roof top sisrequired unlike non-transparent PVSolarpanel.
- The aesthetics sense of using glass windows ispleasing.
- The glass window can further becoloredasmural or painting behind the PVlayer.
- This system is convenient as it can be laid on already builtstructures.
- There is a considerable reduction in electricity consumption received from the distributionutility.
- Cell phone integration will lead to self-chargingphones.
- There are however certain limitations associated with the TPV cell system. These are discussed below-

Demerits

- The efficiency of the transparent solar cell is lesser. The performance can be optimized by using different types of semiconductors anddevices after conducting research [2].
- Current prototypes arecostly.However, the costs may come down as the demand rises.
- No widespread use in commercial and householdapplications.
- The incident sunlight changes its position during 12 hours of the day. Therefore, the TPV cells are required to be provided on all directions. As such, the dome type structure is required to be built.

Despite the above-mentioned demerits this technology is going to be quite profitable in long term. In order to overcome the above demerits, more research is required to be conducted. These are some of the areas which require thoroughresearch [3] -

- Use of Artificial Intelligence, Artificial Neural Networks inparticular.
- Detailed study of semiconductor and othermaterials.
- Detailed study of electric fields to optimize the flow of current to theload.
- Pattern recognition using neural networks so as to optimize a visuallight.

The current cost of TPV system is around Rs 5500.00 per square feet. The cost would further come down with increase in usage. Therefore, in coming years the TPV cell systems would be more economical. The increased use of technology would definitely result in lowering down the present cost.

Conclusion

It is necessary to strengthen the non-conventional energy sources particularly solar to cope up with power crises developed due to the shortage of conventional energy sources particularly coal. Due to some constraints in respect of conventional non-transparent solar cells, it is recommended in this article to make use of Transparent Photovoltaic(TPV) Cells. The TPV cells offer duel benefits- visible light is available by blocking harmful UV and NIR rays and moreover there are no space constraints. However, it is necessary to improve conversion efficiency of TPV cells as per report given by MIT Energy Initiative. The performance to these TPV cells can be optimized by conducting research in fields of material science, Electromagnetic fields and Artificial Intelligence.

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   Solar Window as an Energy Source : A Patent Study Hrudya Ravula, Sridevi Bollapragada. ■

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Evidence of Electric Energy in अथर्व वेद

Prof. S. M. Chaudhari

About Article:

Veds are a truly unlimited store of knowledge and skills. A very comprehensive, vast and enormous archive of Vedic literature existed in Bharat (India), but it was destroyed by foreign invaders and was therefore lost, even then, much of it of which were protected by the great god Rishis. Only so today can we peacefully sit under this great tree of knowledge and study and use this great store of divine knowledge. Of course, it is filled with Vedic mantras, but besides spiritual and philosophical, it is also filled with a lot of scientific and physical knowledge. Man needs various things and objects in every stage of his life, and so they represent all the sources of physical knowledge. It is said in the Veds themselves: O man! To know all these things and substances in various forms present in all the Loks and in heaven, water and earth with the help of knowledge.

Some of the अथर्व वेद संहिता सूक्त and their interpretation with respect to engineering aspect are presented in this article. The अथर्व वेद संहिता सूक्त are collected from - अथर्व वेद संहिता by वेदमूर्ति तपोनिष्ठ पं. श्रीराम शर्मा आचार्य.

The interpretation of these सूक्त is drafted by referring to the websites mentioned in reference at the end

नव यो नवतिं पुरो बिभेद बाह्वो जसा। अहिं च वृत्रहावधीत्।
That very electric power maybe e our peaceful friend providing us with the HP to drive our machines light to light up houses and power to produce grains in the fields let it be bring on prosperity and well being moving into numerous currents
स न इन्द्रः शिवः सखाश्वावद् गोमद् यवमत्। उरुधारेव दोहते।
That very electric power may be our peaceful friend, providing us with the horse-power to drive our machines, light to light up our houses, and power to produce grains in the fields. Let it bring on prosperity and well-being for us by flowing into numerous currents.
इन्द्र क्रतुविदं सुतं सोमं हर्य पुरुष्टुत। पिबा वृषस्व तातृपिम्।
Let electricity, so highly spoken of by many learned people, help extract the essence of medicines, thus produced by those who are well-versed in manufacturing things. Let it keep safe and shower, on us the rain, satisfying all
ता वज्रिणं मन्दिनं स्तोम्यं मद इन्द्रं रथे वहतो हर्यता हरी। पुरूण्यस्मै सवनानि हर्यत इन्द्राय सोमा हरयो दधन्विरे ॥१॥
Those two speedily moving forces of attraction and repulsion propel the electric current, powerful like the thunderbolt, pleasant and praiseworthy, in this pleasant plane or car. Manifold are the generating powers for the refulgent electricity borne by speedy moving Somas-various kinds of liquid fuels

अरं कामाय हरयो दधन्विरे स्थिराय हिन्वन् हरयो हरी तुरा।
अर्वद्भिर्यो हरिभिर्जोषमीयते सो अस्य कामं हरिवन्तमानशे ॥२ ॥

The above mentioned speedy forces of two kinds set in motion strong currents, capable of maintaining steady progress in the attainment of one's objective in plenty. Whatever complex as attained by these fast mining horse-powers, is enough to achieve the beautiful objective of his, the manufacturer.

अध ते विश्वमनु हासदिष्टय आपो निम्नेव सवना हविष्मतः।
यत् पर्वते न समशीत हर्यत इन्द्रस्य वज्रः श्नथिता हिरण्ययः ॥२ ॥

Just as all productive works of the manufacturer depend upon waters flowing down with speed, so do all the desired objects of him depend upon you (Electricity), as its powerful striking force cannot be obstructed by any cloud or mountain in the way. It smashes all impediments, with its radiant energy.

अस्मै भीमाय नमसा समध्वर उषो न शुभ्र आ भरा पनीयसे।
यस्य धाम श्रवसे नामेन्द्रियं ज्योतिरकारि हरितो नायसे ॥३ ॥

O well-versed engineer make use of this terrible electric power fit to be utilized for useful purposes by controlling it, for non violent, brilliant light like the dawn. It has the potentiality to help hearing, control energy and spread light in all quarters

इन्द्र इद्धर्योः सचा संमिश्ल आ वचोयुजा। इन्द्रो वज्री हिरण्ययः ॥५ ॥

Electricity is well mixed up with Prana and Apana, the two horse powers, yoked to power of speech. Electric power has the striking power of a deadly weapon and is full of brilliance.

त्वं तमिन्द्र पर्वतं महामुरुं वज्रेण वज्रिन् पर्वशश्चकर्तिथ।
अवासृजो निवृताः सर्तवा अपः सत्रा विश्वं दधिषे केवलं सहः ॥६ ॥

Just as the thundering electricity reduces the vast cloud to nothing by its thunderbolt, so do you, O King, equipped with piercing weapons like the thunderbolt, smash into pieces the vast armies of the enemy, consisting of various units, by your striking power like the thunderbolt. Just as the waters of the cloud released by the electricity, fall down and flow over the earth, similarly the well-equipped armies of the enemy; being subdued by the might of the king are duly regulated by him. Truly do you alone, O King, hold all the power to subdue the foes.

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Maharashtra Electric Vehicle Policy 2021

Prof. K. S. Gadgil

Salient Features:

The Maharashtra government has introduced Maharashtra electric vehicle policy 2021 to accelerate the adoption of BEVs in the state so that they contribute to 10% of new vehicle registrations by 2025. The Government of Maharashtra will provide fiscal incentives, to the buyers of EVs in the state. The incentives are linked to the vehicle type two-wheelers, three-wheelers, four-wheelers, and buses and to the vehicle use case. Vehicle models approved under the FAME II Scheme of Govt of India will be eligible for these incentives and the state incentives will be provided in addition to FAME II incentives.

Demand Incentives for Electric Vehicles

Vehicle Segment	Incentive Available (INR)	No. of Vehicles to be Incentivized	Maximum Incentive per Vehicle (INR)
Electric Two Wheeler (L1 & L2)	5000/kwh	1,00,000	10,000
Electric 3 Wheeler autos (L5M)	5000/kwh	15,000	30,000
Electric 3 Wheeler goods carrier (L5N)	5000/kwh	10,000	30,000
Electric 4 Wheeler cars (M1)	5000/kwh	10,000	1,50,000
Electric 4 Wheeler goods carrier (N1)	5000/kwh	10,000	1,00,000
Electric buses	10% of vehicle Cost	1,000	20,00,000

Vehicle Segment-wise Scrap page Incentives

The vehicles eligible for demand incentives under this policy will be eligible for the scrap page incentive. Vehicle segment-wise scrap page incentives are described in Table Scrap page incentive shall be reimbursed by the Government of Maharashtra provided:

- Evidence of matching contribution from the dealer or OEM
- Confirmation of scrap page of the ICE vehicle in the same vehicle category
-

Vehicle Segment	Scrap page Incentive
Electric Two-Wheeler	INR 7,000
Electric Three-Wheeler	INR 15,000
Electric Four Wheeler	INR 25,000

Assured Buyback and Warranty Incentives in Maharashtra EV Policy 2021

Incentives Description	Incentives
Assured Buyback	6% of total vehicle cost capped at INR 10,000/-
Battery warranty of at least 5 years	4% of total vehicle cost capped at INR 6,000/-

Incentives for EV Charging Infrastructure

Public and Semi-Public Charging Stations (PCS and SPCS), as defined in Annex 1, shall be eligible for demand incentive. The charging station will be eligible for the incentive only after the station starts operating. The operational guidelines will define the eligibility criteria for availing of these incentives. Public and semi-public charging stations availing FAME II charging infrastructure incentives will not be eligible for these incentives.

Type of PCS/SPCS	Incentive amount	Maximum Incentive available per PCS/SPCS	Maximum number of PCS/SPCS to be incentivized
Slow	60% of the cost	INR 10,000	15,000
Moderate/fast	50% of the cost	INR 5,00,000	500

Download Maharashtra State EV policy 2021

1.	https://www.transportpolicy.net/wp-content/uploads/2021/08/Maharashtra-EV-Policy-Final-2021.pdf
2.	https://e-vehicleinfo.com/maharashtra-ev-policy/

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India calls for need to manufacture EV battery cells locally

Prof. V. P. Kuralkar

Electric vehicles are on the rise in the global automotive market today with steady month-on-month sales growth. In India, at present, there are 12 lakh+ electric vehicles on the road and in the next two years, this number will reach 40 lakhs. So, what is the reason for the huge success of electric vehicles?

There are many reasons for India's inclination toward this latest technology, some of them are as follows:

- Produce Zero emissions (Environment Friendly)
- Higher efficiency
- Low Running Costs
- Less maintenance of EVs
- Increased prices of fossil fuel
- Revolutionizing the Auto Industry

As we can see, electric vehicles are offering a lot of advantages over traditional IC engine vehicles. But the biggest obstacle to the generalization of electric vehicles is their power source, the battery.

EV Batteries Pros & Cons?

Being the heart of EVs, the battery has both pros and cons over the conventional power source i.e., IC Engine. Net zero emissions, silent operation, high efficiency, etc., are visible on the brighter side whereas Low power density, decreased storage capacity after prolonged usage, sensitivity to the external environment, etc., can be seen if we look deep into this technology. But the biggest hurdle for the Electric Vehicle industry is not manufacturing lithium-ion cells locally in India. Yes! We are mostly importing cells from China or the EU and assembling them in India

India imported 450.3 million units of Li-ion batteries worth $929.26 million (over INR 7,200 crore) in the April-November period of the financial year 2019-20. Union Minister Harsh Vardhan informed the Lok Sabha in February 2020.

Can India manufacture batteries locally?

In India, there are around 250+ new EV startups that are continuously working on electric vehicle technology.From small startups to big players in the electric vehicle market, every company is investing in battery development to bring more and more electric vehicles to Indian roads. It is clear that throughout the years, the power density graph of batteries has been steadily increasing. If clicked, electric vehicles could act as a savior, freeing India from its burdened oil imports and giving it partial independent status in geopolitical situations. Everyone is thinking the same and not paying attention to one thing… that is, we are not even manufacturing batteries in India.

This is because most of them, almost all the companies that are manufacturing EVs in India, are importing cells from China or the EU and assembling them here. Again, keeping India in a dependent position. Similar to importing fuel and manufacturing fuel tanks. The cells which have not developed given the Indian climatic conditions are struggling to survive on our roads.

Why is India not manufacturing battery cells locally?

The reason for this is that India is not yet involved in the manufacturing of battery cells, even though the market for the same is unreasonably high, it is a disappointing fact that India does not have reserves of lithium. Which is required for the manufacture of battery cells for lithium-ion, LFP (lithium Ferro-phosphate), and LTO (lithium titanium oxide).

India's Position in manufacturing Lithium Ion Battery Cells?

A company called 'Log9 Materials' has come forward to manufacture cells locally with their innovative material selection and sourcing. The firm is launching tropicalized ion battery (TiB) backed by LFP and LTO chemistries. When it comes to LFP, we have huge reserves of rock phosphorus, graphite, copper, iron, and aluminum. When it comes to LTO, we have titanium, aluminum, and huge reserves of manganese that can go into the cathode. LTO offers longer life and rapid charging whereas LFP has an upper hand on cost efficiency and durability. A combination of these two can fill the void for the perfect battery in an EV battery.

Refer Website Link:
https://e-vehicleinfo.com/india-calls-for-need-to-manufacture-ev-battery-cells-locally/

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Smart Grid Communication

Prof. S. S. Landge

The traditional electricity grid has four major components: power generation, power transmission, power distribution, and grid operation. Power generation usually consists of numerous types of generation plants, such as fossil-fuel power plants and nuclear power plants. The generated electricity is fed into the transmission network. It consists of High voltage and extra high voltage transmission lines and transmission substations. It delivers power over long distances. This electricity is handed over to the distribution subsystem and then dispatched to the customers. Power operation monitors and controls the flow of electricity and all grid components and is essential to the proper functioning and efficiency of the grid.

SMART GRID FRAMEWORK

The smart grid communication framework consists of three networks: the operation network, the business network, and the consumer network as shown in fig. 1. Each of these three networks represents a different set of communication networks serving for different functions. The operation network is used by power companies for maintaining the grid functionality. The business network is used by participants in the electricity market to efficiently regulate the market and to provide electricity services to consumers. The consumer network is used by each consumer for management of home energy and to enhance the electricity usage.

The operation network is the backbone of the smart grid communication system. The design of operational network requires a deep understanding of the existing power system. It involves collaboration with power system and communication engineers. The business network is the connection between the operation network and the consumer network. It's design requires knowledge of economics and government policies It maximizes the efficiency of the electricity market. The consumer network is used for serving the end users. It also exploits the advantages retrieved by the other two entities.

The important merits of this network are that it captures the major differences between the communication systems used in traditional electricity grids and in smart grids.

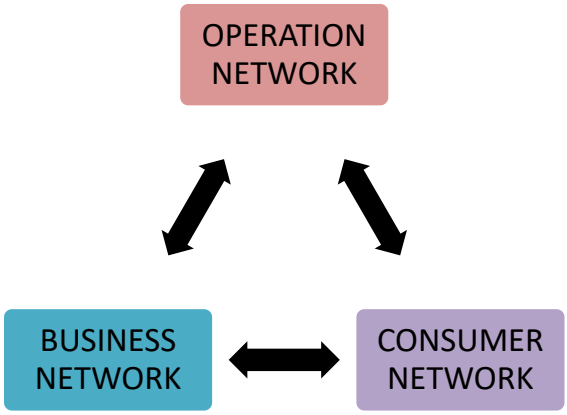

figure 1. A smart grid communication framework

COMMUNICATIONS WITHIN AND BETWEEN ENTITIES

a. Communications in the Operation Network

The operation network consists of seven major components: the business network gateway (BNG), consumer network gateway (CNG), control centers (CC s), generation station (GS), substation (SS), transmission facilities (TFs), and wide-area monitoring and control network (WAMCN).

The BNG and CNG are the communication bridges. It connects the operation network with the other two entities. As the three entities are used by different parties and serves different purposes in the smart grid, when interentity communications are needed, the BNG and CNG serve as firewalls. It protects the operation network from external, malicious attacks.

CC s is the central control units of smart grid. The monitoring and control database (MCD B) is storing all grid operation information. This is accessed by CC s and maintained by database managers. In the traditional electricity grid, CC s follow a strict hierarchical design, with each grid area controlled by a single CC that in turn is controlled by upper-level CC s. A distributed CC design has strong advantages over the centralized one in increasing service availability. The distributed CC design is therefore taken as the future of control in the smart grid.

The GS component usually consists of a collection of large power generation stations, each of which may contain many sensors and actuators connected by a local-area network (LAN) and controlled by a local control unit. The local control unit in each GS communicates with CCs via the WAMCN, through a gateway. This second gateway, which complements the CNG and BNG, is used to prevent insider attacks initiated by someone who has managed to get into the WAMCN

The SS component is the collection of transmission and electricity distribution substations. It typically has a communication structure similar to that found in the GS component. Since distribution substations are close to consumers and are sometimes configured so as to have access to consumer data via the CNG , the privacy of those data must be carefully protected. Other than that, the communication requirements inside the SS and GS components are mostly the same.

The TF component consists of the assets involved in long-distance electricity transmission. These assets include transmission towers and underground cables. The TF component consists of some remote control terminals and a huge number of sensors and actuators located across a wide area. These terminals, sensors, and actuators are connected via a wide-area, high-speed network. Usually, data gathered by the TF component are concentrated by remote control terminals to avoid network congestion before being sent into the WAMCN and delivered as needed.

The WAMCN is the backbone of the operation network and is used to transfer huge volumes of data among the GS, TF, SS, and CC components. In designing the WAMCN, the following requirements must be met:

- High availability: Since the unavailability of the WAMCN means the loss of most communication services, it is crucial that backup schemes for this network be properly provisioned.
- High security: Although gateways such as the CNG and BNG are installed in the operation network, the routers and switches inside the WAMCN still need to be able to resist insider attacks.
- Quality of service: Since different types of data are needed by different parties and different applications, the WAMCN needs to be able to prioritize data transmissions according to needs.

- Compatibility: During the process of upgrading the existing grid to the smart grid, it is possible that multiple legacy protocols that are incompatible with each other will be used simultaneously in the operation network. Protocol translators in the GS, TF, and SS components can help alleviate such problems. The WAMCN must employ a globally accepted protocol such as the Internet Protocol (IP) to truly accommodate such compatibility requirements.

b. Communications in the Consumer Network

The consumer network is made up of six major components: the BNG and operation network gateway (ONG), the smart meter (SM) component, the home electronics (HE) component, local energy management (LEM), a smart controller (SC), and a LAN.

The BNG and ONG here serve as the primary protectors of the information inside the consumer network against intrusions by outsiders. Since data protection requirements at the consumer end are usually less stringent than those in the operation and business networks, designing these two gateways is a simpler task. The only major concern is the protection of consumer privacy. The BNG and ONG in the consumer network should be designed in such a way that consumers are aware of the types of information being requested by other parties and are capable of deciding whether or not the requested information should be released.

The SM is the electricity meter, with a built-in communications module and processor. It receives real-time electricity price data from the business network and sends consumer consumption profile data to the operation network. The price information received by SM is used by other components in the consumer network to perform various functions, and the environmental data collected by the sensors on those appliances, the power level of these appliances may be automatically adjusted to reduce overall electricity costs. An extra gateway is proposed to control access to the HE component, for security reasons. This gateway provides security functions, such as an authenticity check, to protect the appliances from being controlled by unauthorized parties.

LEM is present on the consumer network to accommodate distributed energy generation, such as small-scale wind generation or solar panels, and larger energy storage devices such as electric vehicles at a consumer's premises. With these distributed generation and storage assets, a consumer can actively participate in the electricity market by selling stored electricity when the price is high and purchasing extra electricity when the price is low. LEM is under the control of the SC, and the decision is made largely based on the current electricity price shown by the SM, which is in turn based on the current electricity demand-supply relationship in the market and the operational status of the grid. The SC is the central controller on the consumer network and is therefore considered its most important component. Since the functionality of the SC relies heavily on the LAN, the LAN is seen as essential to the consumer network.

Two of its most important general communication requirements can be summarized as follows:

- Authenticity: Since consumers' premises usually are close to each other, undesirable consequences may be caused if a command issued by the SC in one consumer's home is accepted by the appliances inside another consumer's home. As a result, it is necessary that the LAN in the consumer network be able to encrypt messages in such a way that only authenticated devices can decrypt the contents and only authenticated commands are executed. This functionality may be aided by the HE gateway.

- Integrity: LAN in this context does not require high reliability or low latency but it must be ensured that the integrity of messages is strictly guaranteed. For instance, it must be ensured that the HE component will only execute commands issued by the SC if they are guaranteed to have been correctly received.

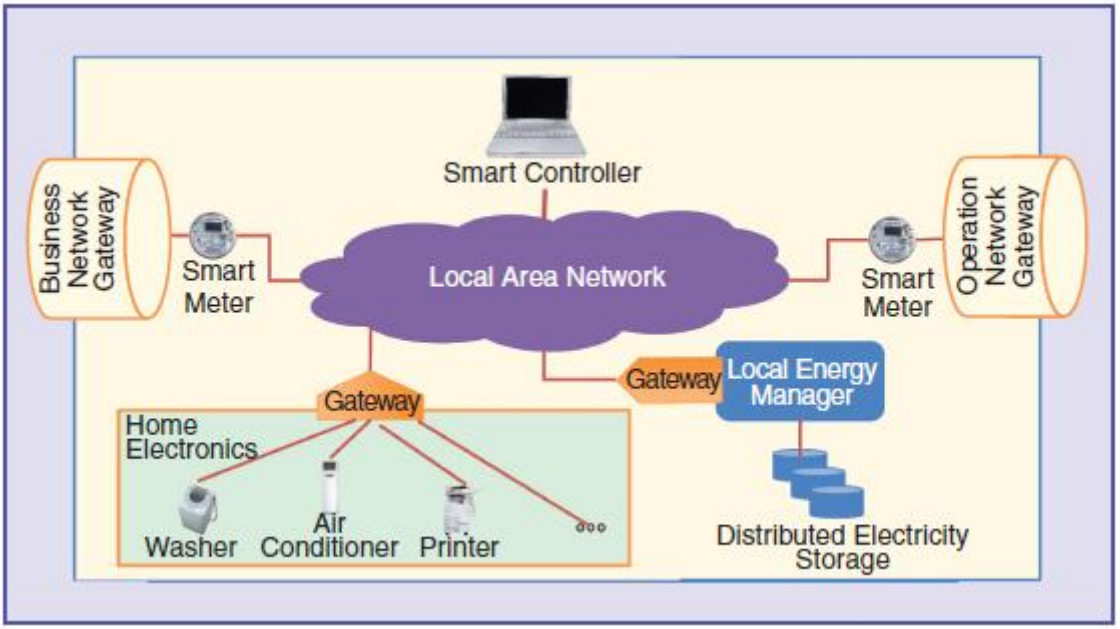

figure 2. The Consumer network

c. Communications in the Business Network

The business network does not possess dedicated communication architecture. It includes numerous new participants and players in the electricity market that communicate with each other using an IP based virtual private network (VPN). As shown in Figure 3, the electricity market regulator, smart meter service provider, demand responder, and electricity market participants are the major players in the business network. There are also parties that communicate with the consumer and operation networks to obtain smart meter data and smart grid operation data via the CNG and ONG, respectively.

Communications within the business network are mostly for commercial use, and hence economy and security are of the utmost concern. This will not be a big issue once an IP based network is used, however. Since IP has been under development for decades, players in the business network will not have much difficulty finding their desired applications and services from the market.

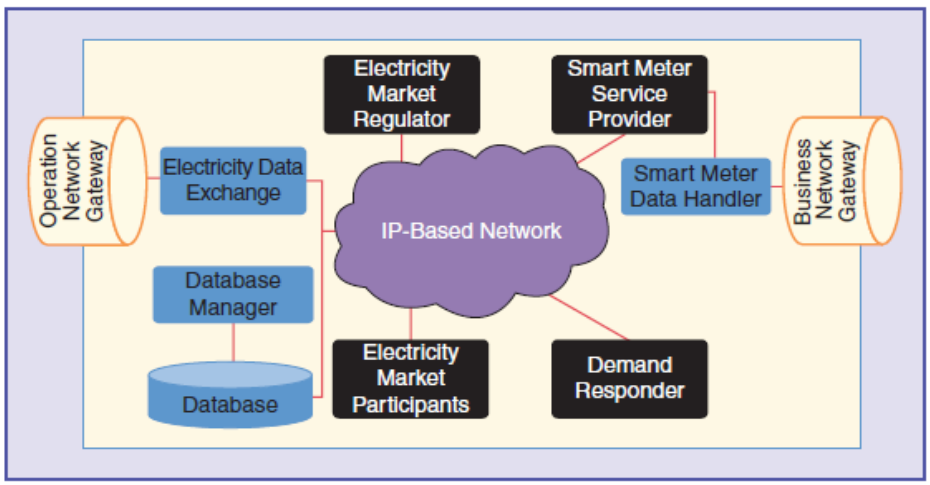

figure 3. The Business Network

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Artificial Neural Network Based Electricity Theft Detection

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***Abstract*- The theft of electricity is a matter of concern for the distribution utility today. The Aggregate Technical and Commercial (AT&C) loss of Maharashtra State Electricity Distribution Company is around 20.72% for the year 2020-21. The main cause of such a higher loss is pilferage or theft of electricity. As per statistics given by various distribution utilities, the theft incidences of three phase HT and LT consumers are under control. However, there is a rising trend in tampering of single phase meters. Various methods of theft detection of single phase meters are in existence, however, tampering of meter by inserting the resistive link in parallel with the meter cannot be detected using these conventional methods. In this paper, a novice technique of tamper detection using Artificial Neural Network is proposed. The proposed method is cost effective and feasible.**

Keywords- Artificial Neural Networks (ANN), Energy Meter tamper, AT&C loss, Sigmoid function, Chaining

I. INTRODUCTION

Maharashtra State Electricity Distribution Company (MSEDCL) is one of the largest distribution utilities in India and even in Asia. It has a vast consumer base of more than 2 Crore 70 lakh consumers. The overall Aggregate Technical and Commercial (AT&C) loss in the year 2006-07 of the company was as high as 33.89% [1]. The measures were taken such as replacement of faulty meters, providing metering cubicles and metering boxes and appropriate sealing arrangements. As a result, the AT&C loss was reduced to 20.72% for the year 2020-21. The main reason for a higher loss has been attributed to the theft of electricity [2]. Therefore, in order to further reduce losses, it is necessary to detect theft cases and take action against miscreants. Following are some of the modus of tampering of energy meters [3].

1. Neutral current reversed
2. Phase current reversed
3. Phase and neutral current reversed
4. Current bypass method
5. Partial load earthed and neutral current reversed
6. Partial load earthed and phase current reversed
7. Full load earthed returned
8. Full load earth and current reversed
9. Partial load earthed returned

The theft events of HT consumers have been brought under control but the theft events at LT side consumers particularly single phase residential and commercial consumers are still there [4][5]. The practice of tampering of the meter by inserting a resistive link in parallel with the meter is common but not covered by the existing methods stated above [6]. This paper presents a novice, cost effective and feasible method of detection of theft committed by miscreants by inserting the resistive link in parallel with the meter.

II. MODUS OF OPERANDI

There are number of ways by which the energy meters are classified. The basic way of classification of meters is made as per number of phases. Based on number of phases, the energy meters are classified as single phase, two phase and three phase meters. The single phase meters are generally provided for residential and small commercial consumers having a load of 5 Amp (rated) to 30 Amp. The three phase meters are provided at big commercial and industrial consumer installations having a load 10 Amp (rated) to 40 Amp. The two phase meters are provided for traction systems such as railways. Most of the theft cases have been detected in respect of single phase residential or commercial meters. Incidentally this is to mention here that the theft cases in respect of three phase H.T. (High Tension) consumers are under control because of practices such as use of metering cubicles and meter boxes. The energy meters are further classified as electromechanical meters, static meters and numeric meters. The electromechanical meters comprise of current coil, pressure coil, electromagnet and aluminum disc. The static meters are based on the operation of Silicon Controlled Rectifiers (SCRs) and do not have rotating parts. The numeric meters are microprocessor-based meters. These meters work on the principle of sampling. The single phase residential and commercial meters are provided with static meters.

Fig.1 shows the series connection of two single phase meters. The right-hand side of the Fig.1 shows the modus of

operandi in respect of a single phase, static, billing energy meter named as the main meter. The practice of tampering of meter is made by opening the meter cover and putting a resistive link in parallel. The current is bifurcated into two paths as shown in fig1. - through the meter and through the link. For instance, the 5 Amp current consumed by the load is bifurcated into 2 Amp (through a main meter) and 3 Amp (through a link). Thus, the consumer will utilize 5 Amp current but he will be billed only at 2 Amp.

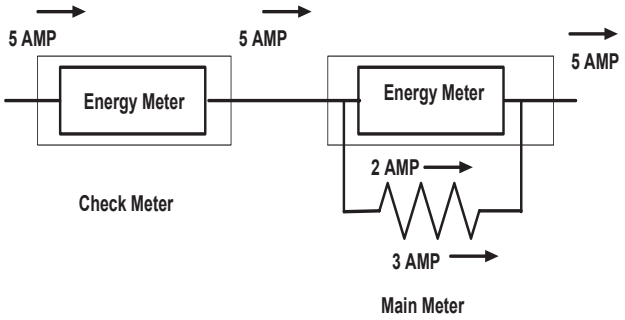

Fig.1.Tampering of Single Phase Energy Meter

Such types of incidences of theft have been observed at number of single phase residential and commercial metering installations.

One way to detect such type of theft is providing a check meter at utility side as shown in Fig.1 and comparing the consumption. If there is dissimilarity in consumption indicated by these two meters, the theft of energy can be detected. However, considering a large quantum of more than 2 Crore, 70 Lakh consumers in Maharashtra state, this is not a feasible solution to provide check meter at each and every consumer. Under this situation, the Artificial Intelligence (AI) based methods which are suitable for Big Data are found to be appropriate. Therefore, the research has been conducted on using Artificial Neural Networks (ANN) for theft detection. Based on the research, the novice and cost effective method of tamper detection of a single phase meter is proposed in this paper.

III. Artificial Intelligence Applications in Electric Power Distribution

Artificial Intelligence (AI) is the mimic representation of a human behaviour. It is a replacement of a human by computer. The number of technologies have been developed under the umbrella of AI. These are Artificial Neural Networks (ANN), Fuzzy Logic Systems, Genetic Algorithms, Robotics, Natural Language Processing, Expert Systems or Knowledge Base Systems, etc. Machine learning is the study of computer algorithms that bring out improvement using experience and data. It is a capability of a machine to imitate intelligent human behaviour. Machine learning algorithms use historical data as input to predict new output values. Thus, machine learning is the data driven technique that works on past data. The famous products based on machine learning are Tesla, Google Car, and Alexa.

Machine learning is the subfield of Artificial Intelligence(AI), that mainly focuses on design of the system and thereby allowing it to learn and make prediction based on experience which is a data for the machine [7]. In other words, computer uses experience as a data. Observations of some experiment can also be treated as experience and used as data. Image recognition is the good real-world example of machine learning. Based on black and white pixels of an image, image recognition can be done effectively using machine learning. Python language can be used as a back-end tool for this purpose. If the computer is given access to data, then it learns from the data itself.

There is a difference between Artificial Intelligence(AI), Machine Learning (ML) and Deep Learning (DL). DL is the subset of ML and ML is a subset of AI. AI confirms whether the computer thinks like a human being or not. Machine Learning mainly focuses on design of the system and thereby allowing it to learn and make prediction based on experience which is a data for the machine. When the network is trained the model finds expected output accurately with never seen input.

Based on Machine Learning algorithm, the source code is written. For this purpose, Python is the most accepted language. Python is an interpreted, high level, general purpose, object oriented, platform independent, web enabled dynamically typed programming language developed by Guido Van Rossum at National Research Institute for Mathematics and Computer Science in the Netherlands. As of today, it is one of popular programming languages all over the world. Python language is simple and easy to understand, yet it is a powerful language. It comprises of extensive set of libraries. It is widely used in new technologies such as data science, big data, machine learning, Internet of Things, cloud computing and artificial intelligence. Google, You Tube, Instagram, Dropbox, Quora, Big Torrent, Delug, Cinema 4D and Mozilla Firefox are some of famous and globally used applications based on Python.

Numbers of machine learning based applications have been developed in the field of electric power distribution sector. Both, distribution utility and consumer have been benefited in the advent of the AI based applications. Some of these applications are as follows-

1. Load forecasting is conducted effectively using linear regression and Artificial Neural networks. The generation planning is taken up for the future accordingly.
2. The proactive maintenance of substation equipment is carried out wherein the life of the equipment is predicted using AI based Residual Life Assessment (RLA) techniques. After ascertaining the balance life of equipment, the life extension schemes are implemented.
3. Using image recognition, the hot spot being developed on substation lines and equipment is detected and attended so as to avoid the unforeseen event of flashovers and fire hazards.
4. The load frequency control is achieved effectively using Artificial Neural Networks. This helps to avoid grid disturbance and cascade tripping of the

transmission network due to a rise in load and a fall in system frequency.

5. The main reason of higher Aggregate Technical and Commercial (AT&C) losses of the distribution utility is the theft of electricity. As discussed in this paper, the electrical theft committed by the miscreant by tampering with the energy meter is detected using Artificial Neural Networks. The methodology is discussed in below mentioned sections.
6. The occurrence report at substations and operational instructions can be given in a regional language through the feature called Natural Language Processing (NLP) and chatbot. Both, NLP and chatbot are part of Artificial Intelligence.
7. The unmanned substations can be operated and maintained using robotics which is the feature of Artificial Intelligence.

IV. The ANN Based Theft Deiection Model

The human brain comprises of billions of nerve cells called neurons. The neurons are connected by the links called dendrites and axons. The neurons get input from eyes, nose, touch etc. The inputs received by neurons are processed and send forward for further activation. This network formed by neurons and dendrites is called Biological Neural Network (BNN). The BNN works on parallel processing [7].

Based on this analogy the Artificial Neural Networks are developed. The ANN are massively parallel computing systems comprising of large number of processors having interconnections as inspired by the BNN [8].

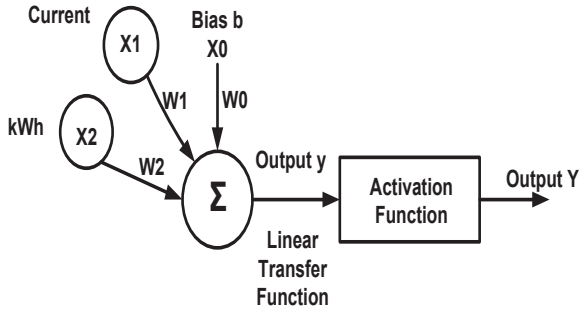

Fig.2. ANN Model for theft detection

Fig.2 illustrates an ANN model for theft detection. The ANN model basically comprises of three layers- input layer, hidden layer, and output layer. At the input layer, the input signals x_1 and x_2 are received by ANN as current and kWh respectively. The bias signal b is given additional to input signals. It is possible to include bias at the input layer. Input x_0 having weight w_0 can be taken in the input layer such that w_0=b which is bias. These inputs are fed to a linear transfer function at hidden layer through links formed by synoptic weights- w_0, w_1 and w_2. All inputs are modified by a weight (e.g., multiplied by weights) and then added at the output layer, giving output, y[9]. This junction is called perceptron which is similar to neuron in case of BNN. The expression for output y is expressed in form of the following linear equation.

$$y= w_0x_0 + w_1x_1 + w_2x_2 = \Sigma_0{}^2 w_ix_i \quad (1)$$

In order to obtain a scalable output, the output y is further processed using an Activation function. There are number of Activation functions such as Sigmoid, Rectified Linear Unit (ReLU), hyperbolic tangent, etc. The Sigmoid function is an activation function that yields output Y between 0 to 1. The Sigmoid function is expressed as follows [10].

$$Y = \frac{1}{1+e^{-y}} \quad (2)$$

The network forming a sequence of the input layer, hidden layer and output layer is called feed forward network. The output so obtained through a feed forward network is called as predicted output. The predicted output (Y) is compared with the targeted output (T). The deviation between predicted output and targeted output is called as error, denoted by e [11]. In order to achieve a targeted output, ideally, the error should be obliviously zero. The error would be minimum at its gradient with respect to weights. Gradient is the rate of change of error with respect to weight (de/dw). In order to determine gradient, it is required to travel back from error to weight. This process is called as back propagation. There are different methods of back propagation such as Chaining, Gradient Decent method and so forth [12].

The following ANN based algorithm is developed for the proposed method of theft detection.

a. Creation of a neural network. The synoptic weights are initialized randomly. In Python, the random library is imported. Alternatively, the Numpy library can also be imported. In the proposed method, the Numpy library is used for the generation of random numbers.
b. The input datasets are applied to the network. In the proposed method, ten data points are applied as shown in TABLE I.
c. The other parameters of the network are set such as bias, threshold and activation function. The output is calculated using Python source code.
d. The calculated output is compared with the targeted output. In the proposed method, the targeted output is obtained from the consumption shown by the check meter. The difference between calculated output and targeted output is called as an error.
e. In order to minimize the error, the gradient of the error with respect to weight is determined through back propagation. For this purpose, the techniques namely Gradient Descent and chaining rule are applied in the proposed method.
f. The steps d and e are repeated through the number of iterations till the error is reduced to the acceptable range. This phenomena is called training of the network.
g. Once the network is trained, it is validated by applying test inputs. As shown in TABLE II, ten test inputs are applied for validation.

V. LABORATORY SET UP

The exercise was conducted in a laboratory of the Electrical Engineering Department, AISSMS IOIT, where two single phase static meters were connected in series. The components required for the set up are- two numbers of single phase meters, single phase lamp load, dimmerstat, voltmeter, clamp-on ammeter, and laptop. As per the directives of the State Electricity Regulatory Commission, it is mandatory to use static meter to record billing energy in case of single phase consumers. As shown in Fig. 3, the right side meter was configured as main billing meter under study and left side meter was configured as a check meter. The variable resistive load (lamp load) was connected as a load. The values of kWh consumption of the main meter and check meter were found to be similar as shown in observations furnished below in TABLE I. Next, the tamper event was created by connecting a resistive link across the main meter as shown in Fig. 3. It was noticed that the unit consumption shown by main meter was lesser as compared to that shown by check meter as shown in TABLE I. The experimental observations were fed to the ANN model. During initial iterations, the ANN was not trained. After undergoing the number of successive iterations, the neural network was fully trained and the appropriate conditions of normal and tamper are obtained.

Fig.3. Experimental setup for tamper detection

TABLE I. OBSERVATIONS

Current Amp	kWh Main Meter	kWh Check Meter	Theft Units (kWh)
5	1.15	1.16	0
4.34	0.998	0.999	0
4.7	0.59	1.08	0.49
5	0.57	1.15	0.58
4.5	0.529	1.03	0.501
3	0.69	0.69	0
2	0.46	0.47	0
1	0.23	0.232	0
1	0.5	1.23	0.73
2.8	0.60	0.64	0

The theft units shown in TABLE I are obtained from the difference of the units of main meter and check meter. A very low difference is truncated as zero.

VI. EXECUTION OF ANN FOR THEFT DETECTION

A Python code was developed based on ANN model for tamper detection. The main features of the code are as follows-

1. The library Numpy (Numeric Python) is imported to execute mathematical functions, Sigmoid function in particular. The weights are initialized randomly using random function available in Numpy. Alternatively, the random function can be imported separately.
2. The datasets are formed using arrays or tuples. If the size of data is more, separate data file can be connected to the code at back end. The data file can be Excel spreadsheet or Comma Separated Value (CSV) file.
3. The Sigmoid function and its derivative are assigned as user defined functions. These are not in-built functions in Numpy or any other Python library.

Initially, status 0 indicates normal condition whereas status 1 indicates that the tamper has been detected. Based on previous results obtained from field, the datasets have been prepared comprising of three parameters- current and kWh for main billing meter and status. Status indicates targeted output. This historical data contains both- normal and tamper conditions. The weights w_1, $w_2$and bias are initialized randomly by Python. The output y is determined as per equation (1). Using Sigmoid function, the output Y is computed as shown in Fig. 2. It is defined that the theft event is detected at mode 1. Therefore, if output value is less than its threshold of 0.8, the connection is normal, otherwise the theft event is generated by the neural network.

The output Y is compared with targeted output T. Then error e is computed as a difference of calculated or predicted output(Y) and Targeted output (T). The square of error is computed and is differentiated with respect to weights w1 and w2 by using chaining rule as follows-

$$\frac{\partial e}{\partial w} = \frac{\partial e}{\partial Y}\frac{\partial Y}{\partial y}\frac{\partial y}{\partial w} \tag{3}$$

The chaining is conducted through the number of successive iterations. The convergence is said to be reached when the values of weights do not change with respect to iterative cycles. At convergence the error is minimum. As such the predictive output approaches the targeted output.

VII. RESULTS AND FINDINGS

In this way, the model has been prepared using training data and test data as shown in Table I and as per set up given in Fig. 3. The observations have been undergone in the detailed manner and results are obtained. The sample results obtained after giving adequate training to the network are furnished in TABLE II. The tamper event was generated by connecting a link in parallel with the meter in case of serial numbers 1,2,5,8 and 10 given in Table. In other cases, normal status is maintained.

TABLE II. SAMPLE RESULTS

Sr. No.	Current Amp	kWh Main Meter	Program Output
1	5.0	0.50	Meter tamper event detected
2	4.0	0.30	Meter tamper event detected
3	4.0	1.01	Connection normal
4	3.0	0.75	Connection normal
5	3.0	0.21	Meter tamper event detected
6	3.5	0.85	Connection normal
7	5.0	1.15	Connection normal
8	4.5	0.20	Meter tamper event detected
9	2.0	0.72	Connection normal
10	2.0	0.21	Meter tamper event detected

The results furnished in TABLE II are found to be appropriate as compared with the corresponding unit consumption displayed on check meter. The observations from the experiment also led to the following results or findings.

1. The prediction of output becomes more accurate if the quantum of the training data points is more. The predicted and targeted outputs normally come close to each other in case of a large number of training data points.
2. The success of the neural network depends on a variety of training data. It is required to cover all conditions of normal and tamper data. Secondly, it is required to cover different loading conditions such as partial load and full load.
3. It is required to take into consideration, various types of loads such as resistive load, capacitive load, inductive load, and their combinations so that the load at any instant of tamper event is covered.
4. Initially, the program execution is delayed as the neural network is not trained. Once the network gets trained, the program execution becomes faster.
5. It takes the large number of iterative cycles to get convergence. It is required to undergo iterations through a range such as 25000 to 100000 depending on the selection of initial values of weights. In this context, the Python code is found to be a proper choice compared to conventional C/C++ and Java platforms. The fast convergence depends on the selection of initial values of weights.
6. The Sigmoid function is found to be a proper choice out of available activation functions. Compared to the other activation functions such as Tanh, Ramp, and ReLU, the Sigmoid function is found suitable.
7. The back propagation is done effectively using Gradient Decent method and Chaining rule, as compared to the other methods.

VIII. COMPARISON WITH EXISTING METHODS

The results have been compared with the existing method of providing a check meter. The consumption displayed by the check meter is compared with the output obtained from the proposed method. The results of both methods are nearly the same.

The other method of theft detection is checking of tamper data generated by the meter. However, as seen from the data retrieved meter (tamper data and load survey data), the tamper event is not indicated in the report. As such the meter cannot detect the theft committed by the miscreant as there is no change in the output of the meter.

It is possible to control such type of tampering by providing metering boxes at consumer installations.

In this way, there are three existing methods – providing check meter, retrieving and analysing meter data and providing meter boxes. However, these methods are not feasible as seen from the huge number of consumers. For instance, there are 2 Crore, 70 Lakh consumers in the state of Maharashtra in India. Therefore, the proposed method would be significant as compared to the existing methods discussed above.

IX. CONCLUSION

The electricity distribution utilities in India are facing a major challenge of reducing AT&C losses. The higher losses are mainly attributed to the theft of electricity. The statistics indicate that more incidences of theft are there in case of low tension, single phase residential and commercial consumers. The general modus of operandi of theft is conducted by tampering of the meter by inserting a resistive link across the meter. In view of the large population of Low Tension (LT) consumers, it is not feasible to connect check meter to each and every consumer. In this context, the novice method of theft detection using neural networks is put forward in this paper, which is based on the concept of Big Data. The exercise of tamper detection was conducted by creating tamper conditions in the laboratory. After undergoing the number of successive iterations, the neural network was fully trained and the appropriate conditions of normal and tamper events were shown correctly by the developed model. The field engineer or meter reader will have to enter only two parameters in his mobile phone – kWh from meter display and current from tongue tester. As such, the method is found to be a novice, accurate, cost effective, and feasible.

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CLEAN IN PLACE SYSTEM USING PLC

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ABSTRACT

In dairy, food industries and pharmaceutical industries, there should be hygiene maintained to maintain the quality and test of the product. This paper focuses on easy, reliable as well as advanced method of cleaning the equipment like big tanks or utensils which used in food industries. As it is dangerous to clean the huge tanks manually, the cleaning process is carried out automatically using programmable logic controller (PLC).

1. INTRODUCTION

In the big industries, it is very important to maintain proper hygiene for the quality of product. Therefore, we need to clean the tanks/pipes on a periodic basis. The main objective of the project is to clean the tank using advanced technology known as Clean in Place. Before the invention of this method the tanks were cleaned manually. But manual cleaning isn't safe for the person who is cleaning. Also, it is time consuming. So, in this project, we have used PLC to make the process fully automatic.

Clean In Place (CIP):

Till 1950s, the cleaning of pipes/tanks was done by dis-assembling the system. Since this method was unsafe as the person cleaning the tanks came in direct contact with various chemicals. So, it proved harmful as well as time consuming. Therefore, the CIP method proved a boon to the industries that require frequent or time to time cleaning.

So, this clean in place method is carried out automatically without dis-assembling any apparatus. This saves time and operators health. This method is used in industries which require high hygiene like dairy, beverage, brewing, process foods, pharmaceutical and cosmetics.

The advantage of this method in industries is that the cleaning is faster, less man power involved, can be carried out many times and less chemical exposure.

2.OBJECTIVE

The main objective of this method is to clean the pipes, tanks, etc. without any manual involvement. It is an automatic cleaning method which cleans the interior surfaces of equipment, vessels, pipes, filters without any major disassembly of the part to be cleaned.

3.PARAMETERS FOR CIP

3.1 Temperature:

Many small particles may affect the quality of product. There are chances that particles may not dissolve in cold water. So, hot water is used for dissolving purpose. Hence, it is important to maintain the water at specific temperature.

3.2 Chemical Concentration:

The chemical concentration of the liquid used for cleaning depends on which type of impurity is to be cleaned.

3.3 Time:

If the chemical used has more concentration, then the time required for cleaning is less.

3.4 Pressure:

The pressure is useful for removal of many small particles with the help of different apparatus like brush or air compressor.

4. GENERAL ARRANGEMENT OF TANKS

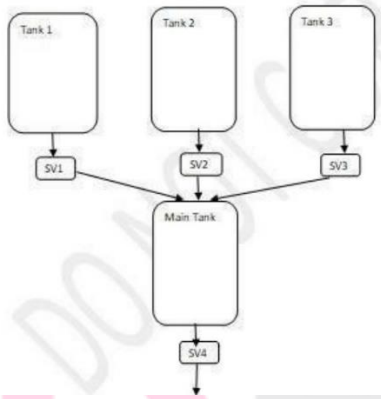

Fig.1 General tank arrangement

The above figure shows the general arrangements of tanks. The main tank which is to be cleaned is placed below the three tanks which contains different liquids required for cleaning process.

Fluids like water, caustic soda, phosphoric and nitric acids, sodium hypo chloride and peracetic acid (PAA) are filled in tanks placed at higher level than the main tank. This arrangement is done so as to utilise the gravity for reducing the pump cost. The all 4 tanks are connected to the solenoids by using RO pipes.

The main tank which is located at the bottom contains motor (pump) inside it and a solenoid valve at the bottom of tank. The valve is used to drain the cleaning agents out of the tanks. This process is the integration of CIP with PLC panel enables end to end process without any human interference.

The process is repeated till the raw materials are finished or the emergency stop push button is pressed.

5. WORKING PRINCIPLE

PLCs are used for specific functions like counting, timing, logic operation, arithmetic and control processes. So, PLC is the heart of the automation industry.

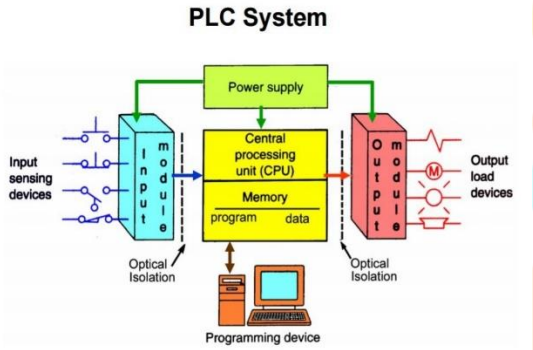

Fig.2.PLC System

The PLC unit consists of CPU unit, input output module, memory unit, power supply and programming devices. Mainly 3 steps are executed in PLC i.e., check input status, execute program and then update the output status. And there are 3 modes: run mode, stop mode and reset mode.

In the cleaning process of tank, when we press start push button, the system gets started. The first step involves cleaning of tank by using cold water and then hot water is passed. Secondly, Caustic soda means sodium hydroxide is passed to clean the metal impurities from the tank to be cleaned. Then the third and last step involves the cleaning by using Phosphoric and nitric acid to salts and minerals present in the tank. The caustic soda and the acids are filled into the tank by using solenoid valve which are connected to the tank. As the whole system is made automatic, the process is operated with the computer.

6. LADDER DIAGRAM

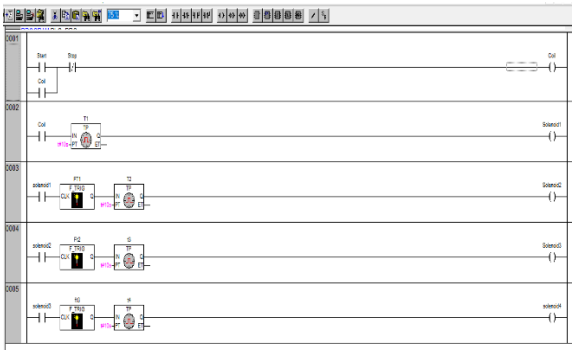

Fig.3 Ladder Diagram

To develop the software of PLC ladder logic is used. It is kind of graphical programming language. It is easier to understand. By using ladder logic, the simulation can be understood quickly. The above fig.3 shows the ladder logic used in the project.

7. CONCLUSION

This method will help in reducing the time required for cleaning of the big tanks, vessels, pipes, etc. This method can become the solution for the critical problem like interaction with the harmful chemicals while manual cleaning which can lead to fatal accidents. Resulting into much safer and time saving in cleaning process in big industries.

An easy and time saving way of cleaning has been designed and developed successfully.

8.Future Scope

- Various level sensors can be used according to the need to detect the level of liquid in the tanks.
- Various pressure and temperature sensors can be used to maintain proper temperature and pressure in the tank.
- The main advantage of this system is that it will reduce the time and efforts required for complicated cleaning of the system.

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Energy Meter Tamper Detection and Alert Messaging System

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ABSTRACT

The theft of electricity is a matter of concern for the distribution utility today. The AT&T loss of Maharashtra State Electricity Distribution Company is 20.72% for the year 2020-21. The main cause of such a higher loss is theft of electricity. Various wireless communication systems are available to detect the theft of electricity, but the utilities do not have the infrastructure to operate them. The aim of the paper is to develop a novice cost effective system for monitoring the power consumed by the load and detect the theft of electricity. This work also focuses on sharing theft information with the distribution utility through the Internet of Things (IoT) technology. As a network comprises of connected devices such as sensors, it can exchange information in real time via the internet. In this project, NodeMCU is used which sends alert to the authorized persons. The main benefit of the proposed system is saving in power consumption. The proposed system is a novice, feasible and economically viable.

KEYWORDS: Tampering, ESP8266, NodeMCU, Current sensors, Blynk Mobile App, IoT

1. INTRODUCTION

Maharashtra State Electricity Distribution Company (MSEDCL) is one of the largest distribution utilities in India and Asia. It has a vast consumer base of more than 2 Crore 70 lakh consumers. The overall Aggregate Technical and Commercial (AT&C) loss in the year 2006-07 of the company was as high as 33.89%. The measures were taken such as replacement of faulty meters, providing metering cubicles and metering boxes and appropriate sealing arrangements. As result, the AT&C losses were reduced to 20.73% for the year 2020-21. In order to further reduce losses, it is necessary to detect theft cases and take action. Following are some of methods of tampering of energy meters.

- Neutral current reversed
- Phase current reversed
- Phase and neutral current reversed
- Current bypass method
- Partial load earthed and neutral current reversed
- Partial load earthed and phase current reversed
- Full load earthed returned
- Full load earth and current reversed
- Partial load earthed returned

This paper presents a novice method of detection of theft.

2. THE PROPOSED METHOD

The proposed method involves use of hardware and software resources as discussed below [1].

2.1. Hardware Tools

The pin connection diagram of ESP 8266 microcontroller is shown in **Fig. 1**. ESP 8266[2] can be described as a computer on a chip. It is an integrated chip that is usually a part of an embedded system. It is a self-contained, independent and yet functions as a tiny, dedicated computer. It also supports IoT Applications due to built-in Wi-Fi connectivity [3].

It is a system-on-chip (SoC) that incorporates a 32-bit microcontroller, antenna switches, power amplifier,

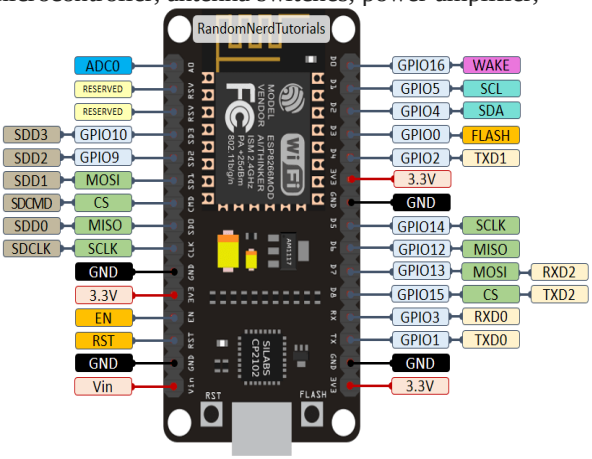

Fig 1. ESP 8266 Microcontroller

and filters. It is compatible of 2.4 GHz, Wi-Fi (802.11 b/g/n), general-purpose input/output (16 GPIO), Inter-Integrated Circuit, Analog-to-Digital Conversion (10-bit ADC), Serial Peripheral Interface (SPI), I²S interfaces with Direct Memory Access-DMA (GPIO), Universal Asynchronous Receiver Transmitter-UART (GPIO2), and Pulse-Width Modulation (PWM). This tiny module enables microcontrollers to link to a Wi-Fi channel and create basic TCP / IP connections [4].

This is the heart and the brain of the proposed paper as it accepts the input from the sensors and initiates action according to the code entered in Embedded C Language. The programming Software used for this purpose is Arduino IDE [5].

2) Current Sensor-(ACS712): -In this method, two Current sensors [3] are used (At source side and load side). The sensor is connected in series with the load from the source to the load side. The current rating is 5 Amp ranging from 0 to 30 Amp.

3) Switches -Switches are used to Power ON / OFF the Load at the theft side as well as at the actual load Side. These switches are of 10 Amp ratings each [6].

4) Load-In this system, we have used bulb as the load. As such, the load is resistive. Approx. power rating of the bulb is 5-9 Watt. This load is connected at the theft side as well as at the actual side. Although the experiment is performed using resistive load, any type of load is preferred [7].

5) Buzzer- the buzzer is a mechanical, electromechanical, or piezoelectric, audio signal device. The common uses for buzzers and beeps include alarms, timers, and confirmation of user inputs such as mouse clicks and keystrokes. In this project, the buzzer plays an important role in alerting authorized people when theft is detected.

6) Power Supply- the 9 Volt battery is used to power the control circuit of the project. Controller supports from 7-12 Volt DC Supply. Once the power is received, it generates the 5V and 3.3V signal across its V_{CC} and GND Pins.

The functional block diagram of ESP 8266 Microcontroller is shown in **Fig. 2** [8]. As shown in Fig.2, the current sensors based on the load side and source side are used and the input current given by sensors is converted to digital where Arduino compares the value, i.e. difference between the values of current sensors and if there is difference greater than zero, it displays the alert message on the LED panel as well the alert notification goes to the authorized person's mobile via Blynk App thus helping them to know theft defection and if there is no difference in values then no alert is detected[9].

2.2 Software Tools

Following are the software tools required for processing data and report generation [3].

Blynk Mobile App: -

It is the advanced Cloud platform that supports IoT Projects and provides the platform to design the Graphical user Interface (GUI). Below is the step to integrate the GUI in Mobile App.

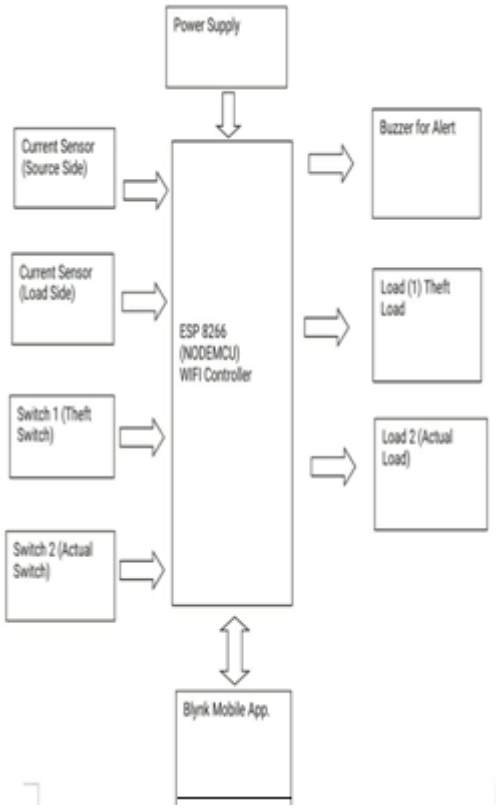

Fig. 2. Functional Block diagram

The link is connected in parallel to the meters. The following equations are established [10].

$$V=I_L R \quad (1)$$

$$V=Is R \quad (2)$$

Where V is the applied voltage in volts across the link.

R is the resistance of the link in ohms

L is the length of link in meters

A is the area of cross section of link in sq. meter

P is resistivity of link in ohm-meter.

such that

$$R = \rho l / A \quad (3)$$

3. METHDOLOGY

The methodology used in the proposed method is based on the IoT based theft detection system. The ESP8266 (NodeMCU) microcontroller and GSM system is used to detect theft. In this method, the current sensors are used which will be connected to the source side as well as load side which will measure amount of current supplied and units consumed by the load. Ideally current sensed by source sensor and the load sensor should be equal. However, considering electric losses the minimum limit is introduced to trigger alarm. But if there is power theft the total load will be equal to the theft load plus the actual load, hence the alarm will be triggered if theft is detected. In the same way the notification will be sent via Blynk App [4] technology.

Figure 3 shows a flow chart explaining a flow of logic in a proposed system. The logic is based on polled approach. The current sensed by the current sensor is the analog quantity [11].

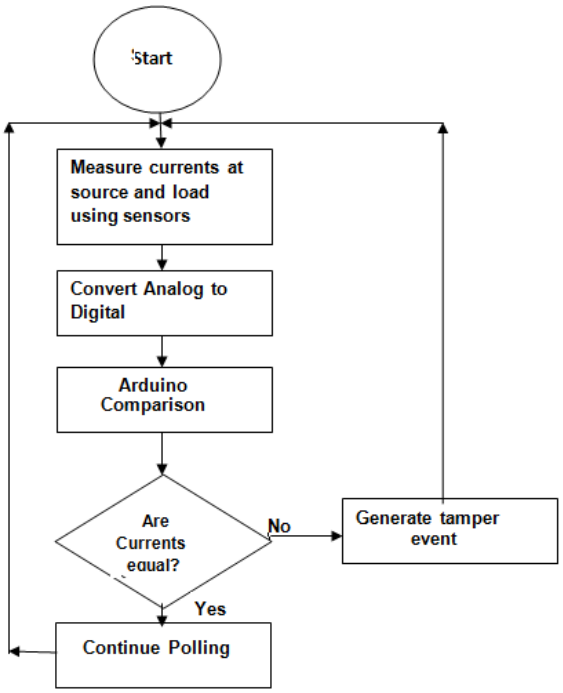

Fig.3. Flow chart

In order to convert this analog quantity into digital form as required by the Arduino processor, the ADC is used. The values of source current and load current are compared by the processor. If the values are unequal the tamper event is generated and messaged. Further, the theft consumption is added to the billed units of the consumer. If the currents are equal the system is assumed to be normal and the process of polling is continued [5].

4. METER TAMPERING THROUGH PARALLEL RESISTANCE

As shown in Fig. 4, the meter is tempered by connecting resistor is parallel with the meter so that the incoming current is bifurcated into billing current and resistive current. In this way the billing current is reduced by dividing it in two parts. For example, as shown in Fig. 4, the billing current is 5 Amp. By connecting resistor in parallel with meter the 5 Amp current is reduced to 2 Amp and balance 3 Amp current flows through the resistor or a link. Thus, instead of 5 Amp the billing would be done on 2 Amp. Unfortunately, the microcontroller provided in numeric meter would be unable to detect this tamper event as it is based on 3 Amp input current. How to detect this tamper event is therefore a matter of concern. The processor of the meter cannot detect that the current is diverted to resistive path. Therefore, no tamper event is generated. Using IoT technology, it is possible to detect tamper through parallel, series and series parallel combination [5]. Therefore, it is required to provide IoT based smart sensors for the detection for such cases. The detection of tamper event by connecting resistor in parallel with meter can be worked out as follows. Select two identical CT Sensors suitable to the secondary current of meter CTs. Such sensors are usually available with the manufacturers of instrument transformers [6].

5. OBSERVATIONS

The condition of tampering of a single-phase static meter was developed in a laboratory. This was named as a main meter. In order to compare the consumption, the main meter was connected in series with the check meter. The condition of tamper was created by connecting link across the main meter to get an idea of parallel resistance. See Fig. 4. The resistance was chosen in such a way that 2 Amp current flows through meter and 3 Amp through a parallel resistance link. The consumption was recorded for the period of one hour. Some readings were noted by connection link and some by removing link at different load conditions [7].

Three parameters were recorded namely- Current, kWh of main meter and kWh of check meter. In all, 10 observations were recorded during the period of one hour. The difference of consumption between main meter and check meter was computed. A very low difference is truncated as zero. Refer Table 1. When the difference is not zero, the tamper indication is generated and the amount of difference is added to the kWh consumption of main meter.

Using the blynk app we get an alert notification that the theft has been detected. Fig. 5 shows the pattern of consumption through the check meter, main meter and link.

Table I. Recording of one hour consumption

Current Amp	5	4.34	**4.7**	**5**	**4.5**	3	2	1	**1**	2.8
kWh Main Meter	1.15	0.998	**0.59**	**0.57**	**0.529**	0.69	0.46	0.23	**0.5**	0.60
kWh Check Meter	1.16	0.999	**1.08**	**1.15**	**1.03**	0.69	0.47	0.232	**1.23**	0.64
Theft Units (kWh)	0	0	**0.49**	**0.58**	**0.501**	0	0	0	**0.73**	0

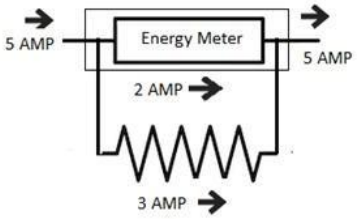

Fig.4. Meter tampers through parallel resistance

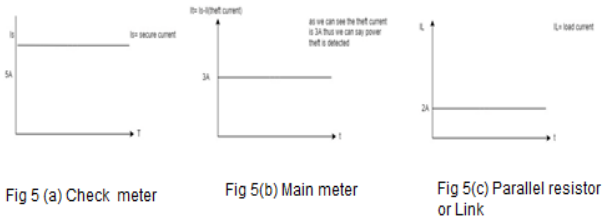

Fig.5. Pattern of current through meter and link

5. CONCLUSION

The main hurdles in revenue generation of the distribution utility are high AT&C losses. Higher losses indicate probability of theft of electricity. The single-phase billing meters installed at consumer installations are static meters. The existing arrangement is unable to detect tampering of meter done through parallel resistors connected across the meter in form of link. This paper has discussed an act of tampering of meter by inserting resistance in parallel with the meter. The novice and cost-effective method to detect this event using IoT Sensors and microcontroller (ESP 8266, Node MCU) and Blynk mobile app is suggested in this paper. The proposed method is found to be suitable and feasible.

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Design and Development of Controller for Driverless Train

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***Abstract* - In present world almost all industrial systems are based on automation system, as it has many advantages. The development of a fully automated train is capable of showing the station on the LCD display with other facility is also designed. The train is programmed for the specific path. Every station on the path is defined; stoppage timing of the train is predefined. Driverless train is rail-based, mass rapid transit systems that operate on an exclusive right-of-way, which is separated from all modes of transport in an urban area. Most often, the right-of-way is either underground or elevated above street level. These systems generally operate at an average speed of 20–35 km/h, and are characterized by their high capacity (50,000–75,000 passengers per hour, per direction) and high frequency of operation. The capital cost of construction is between 20–30 times that of the Bus Rapid Transit system, depending on whether the driverless systems are underground or elevated.**

Keywords: Programmed, Driverless Train, Characterized, Elevated, Driverless System.

I. INTRODUCTION

In India, manual method of operation has been adopted for the control of trains. Also the system has many disadvantages like late running of train, accidents etc. This may cause a lot of error in the manual control system. So here in this project we have adopted fully automated control system for train. A small prototype of the driverless train is developed that is able to show the names of the stations via LCD display. The train is designed to run on the DC gear motor. It has an additional facility of auto-stop at the different stations with the facility of voice announcement at each station.

We have used microcontroller as a CPU unit. The whole movement of the train is basically controlled by the DC gear motor. The system is integrated with the LCD display of two line which shows the station name on it. The train is designed for three stations. The train system is integrated with RFID technology. RFID card is installed at each station and also RFID reader is installed at the train so when reader detects the RFID card, train will get stopped. The stoppage timing is of 3second. There is a facility of showing various messages and announcements via LCD display. It is also has the facility of emergency braking due to which train stop as soon as possible. When any obstacle is detected, train will get automatically stop & train blows the buzzer. Driverless train is rail-based, mass rapid transit systems that operate on an exclusive right-of-way, which is separated from all modes of transport in an urban area. Most often, the right-of-way is either underground or elevated above street level. These systems generally operate at an average speed of 20–35 km/h, and are characterized by their high capacity (50,000–75,000 passengers per hour, per direction) and high frequency of operation. The capital cost of construction is between 20–30 times that of the Bus Rapid Transit system, depending on whether the driverless systems are underground or elevated.

Promoters of driverless train systems often claim that one of the benefits of the driverless train is reduced congestion, due to the users' shift from road-based motorized modes to driverless train systems. This mode shift is then claimed to result in reduced air pollution and road accidents. The project is integrated with multiple facility including security system, voice announcement, display of stations name, buzzer etc. The train is designed for three stations named as Ambad, Sinnar & Satpur.

II. MOTIVATION

In present scenario the load increasing on roads are very irritating and wastage of time, various people can't reach there workplace on time due to it, so that this idea could share some of the load which comes on road. And city could be freed from industrial transportation by which its flow of traffic maintains appropriate, to make country smart and to attract more and more companies, industries toward the country , the following technology can help us out. Most of the accidents occur due to human error only and also due to not proper maintenance of the track. People are not bothering about the small wear and tear of the tracks. Secondly in electric trains fault occurring chances are more. In Chennai metro train daily 10 to 15 trains are getting faulty due to the overload condition and lack of maintenance. By observing all these parameter we decided to make such a train mechanism which is not giving any overload problem and cost maintenance system (driverless).

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This paper gives a closer look on the subject of the conversion of a conventional train in to a fully automated operation without interrupting or disturbing service.

III. PROBLEM STATEMENT

In present scenario the load increasing on roads are very irritating and wastage of time, various people can't reach their workplace on time due to it, do that this idea could share some of the load which comes on road. And city could be freed from industrial transportation by which its flow of traffic maintains appropriate, to make country smart and to attract more and more companies industries toward the country the following device can help us out. Most of the accidents occur due to human error only and also track maintenance people are not bothering about the small wear and tear of the tracks. Secondly in electric trains fault occurring chances are more. In Chennai metro train daily 10 to 15 trains are getting faulty due to the overload condition and lack of maintenance. By observing all these parameter we decided to make such a train mechanism which is not giving any overload problem and cost maintenance system. A large number of miscellaneous problems include late running of trains, lack of passenger facilities like without displaying station name and voice announcement. The driver controlled mode, in conventional modes it's the manual driver who drives the train and control the train operation like starts, stops.

Following Concluded the Problem Statement as:

1. Full Automation in manual train.
2. Auto Stop of train at station using RFID Technology.
3. Collision Detection (Safety System).
4. Security System.

IV. BLOCK DIAGRAM

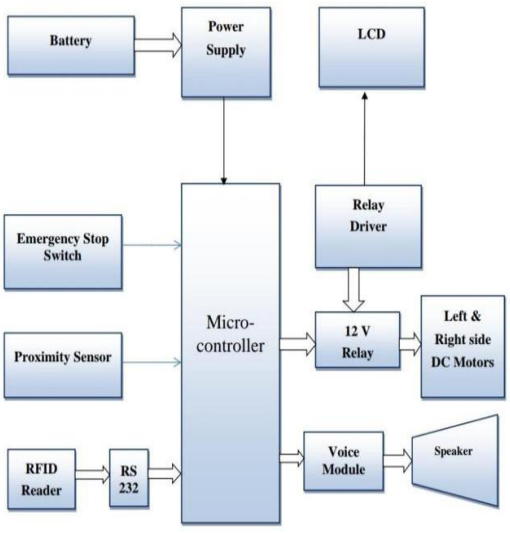

Figure 1: Block Diagram of the System

The blocks shown in the above figure 1 shows the complete flow of our project. It consist of the power supply, LCD display, Relay driver, Microcontroller, Voice module, RFID reader, Speaker, Proximity sensor etc. As the system is powered the welcoming message can be seen on the LCD display. Then train starts normally and stops at the stations using RFID technology. If there is obstacle detected in the route the train immediately auto stop and blows the buzzer till the route is clear. As soon as the obstacle is cleared the train starts normally with the delay of 3seconds.

Power Supply: The power supply section is the section which provide +5V for the transmitter section to work. IC LM7805 is used for providing a constant power of +5V.

Decoder: A decoder is a device which does the reverse of the encoder, undoing the encoding so that the original information can be retrieved.

RF Receiver: The RF signal transmitted by the transmitter is detected and received by this section of the receiver. This binary encoder data is sent to the decoder for decoding the original data.

LCD: This is the output unit in the receiver section. The station name is displayed on this display unit when the receiver comes in the range of the transmitter.

Voice Alert: This is another output unit in the receiver. This gives the voice alert of the station reached based on the RF transmitter signal received.

V. EXPERIMENTAL RESULT

Our work aims to design a full automation in driverless train which is used for drive the train without driver.PIC 18f4550 is the heart of the system which provides the necessary resources of computation & communication among other components. The whole process of fully automatic driverless train goes through various steps while executing the task.

These steps are as follows:

1. After starting the system name of the project displays on the LCD screen for a while.
2. The LCD screen then displays, the station name Ambad. The PIC microcontroller receives data from the RFID reader, reader read data from RFID card at specified identification code, and gives the relative digital using RS232 communication i.e. on LCD display. At same time voice announcement of station done like Ambad station arrive.
3. The LCD screen then displays, the station name Sinnar. The PIC microcontroller receives data from the RFID

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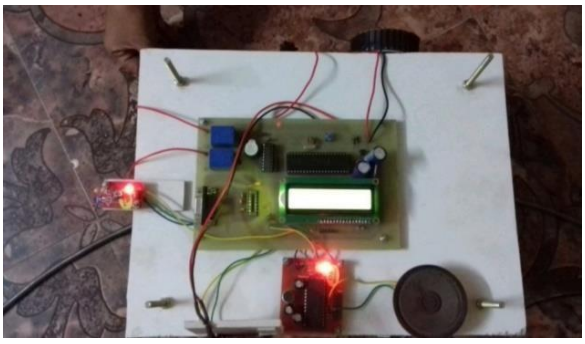
reader, reader read data from RFID card at specified identification code, and gives the relative digital using RS232 communication i.e. on LCD display. At same time voice announcement of station done like Sinnar station arrive.

4. The LCD screen then displays, the station name Satpur. The PIC microcontroller receives data from the RFID reader, reader read data from RFID card at specified identification code, and gives the relative digital using RS232 communication i.e. on LCD display. At same time voice announcement of station done like Satpur station arrive.
5. If there is obstacle in the path of train then this obstacle detected by proximity sensor. When sensor indicates the obstacle the buzzer goes ON. And stop the train automatically also buzzer is in ON condition continuously.



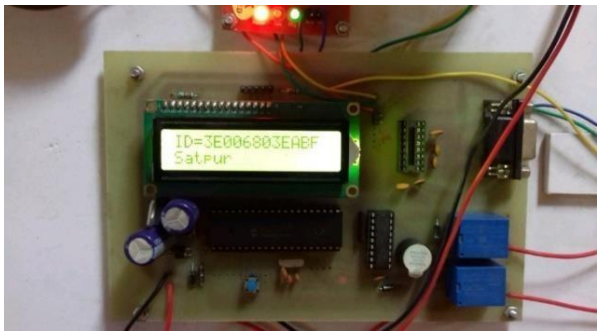


Figure 2: Display of Station Name

VI. ADVANTAGES

- Auto-stop at the pre-defined stations.
- Safety system is integrated while sensing the obstacle in the route.
- Voice announcement facility helps the passenger to know the stations name.
- Load on city traffic will be divided.
- Less Human Error.
- No delay in train arrival.

VII. DISADVANTAGES

- Its path will be limited so it will drop goods only on limited stations.
- The schedule could be disturbed due to technical reason.
- Its passenger capacity will be predefined so excesses entries are not possible.
- High maintenance will require.

VII. CONCLUSION

The rail leads to be the easiest way in city map toward industrial area, so that the luggage and human transport will be preferred by public, by which smart city concept will not be away from this . In which time, money, and efforts will be saved. These types of devices are the real feature of the country which will attract more and more industries towards country.

The presented train control system represents an important step forward concerning the safety and automation of branch lines. The safety level achieved by this means will improve the system safety of traditional operational train control and will ease the automation of branch lines while making them at the same time more cost effective. Further development will take place in implementing new standards in satellite navigation.

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Design And Development of E-Jacket for Women Safety

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Abstract— Women who are victims of abuses are even deprived of fundamental human rights. Gender-based violence has become a national and international program through decades of civil society and women's struggles. Though there are unprecedented numbers of laws against domestic violence, sexual assault and other forms of violence in each and every country to protect their female citizens to become a victim of any such violence but they are facing major challenges in implementing such laws. This makes society unfair and unsafe to women as in the majority of cases the offender remains unpunished.

Atrocities against women can now end with the help of a device known as a safety jacket for women.It is to flash a warning giving an instant location of the distressed victim to the police so that the incident could be prevented and the culprit apprehended. It would reduce the crime against women.

Indexed Terms-- GPS, Buzzer, Camera, Nodemcu8299 wifi module, Gps module.

I. INTRODUCTION

In a global scenario, the first issue in the minds of all girls is their security and harassment issues. The only thought haunting in every girl is when they will be able to move freely on the streets even in odd hours without worrying about their security. Women who are victims of violations are also deprived of basic human rights.Gender based violence has become a national as well as international agenda because of decades long struggles by civil society accompanied by women's movements. That's why there are unprecedented numbers of laws against domestic violence and other forms of violence in each and every country. This project suggests a method to protect women. It focuses on providing security for women so they never feel defenseless.

The system consists of various modules such as buzzer,NodeMcu ESP3266 WIFI Module.An electronic jacket for women safety. It is based on women's security.

It is a simple and easy to carry device with various functions. The basic approach is to bully the instant location and a distress message to the police and recorded number, to avert unfortunate incidents and provide real-time evidence for swift action against perpetrators of crimes against women. The women's safety system, which allows for immediate response to harassment, focuses primarily on two different parts, one is developing mobile applications for women's security and protection and the other, users can press a button that is located on device. The wifi module is embedded with it and sends data to the mobile phone. Mobile phone app sends the messages to predefined contact with live location.

Before initiating for designing an autonomous system which may detect the parameters related to the miner who is working in local mines of Pakistan; it was very important to study the previous suggested systems being proposed in past for same issue and do comparative analysis. There are huge manuscripts available describing the same autonomous systems by which one can get an accurate and exact situation awareness along with alert generation for rescue teams. One may get a rapid support from data acquiring if it is done through pervasive or ubiquitous computing technology. This will not only increase the computational capability for communicating but it will also provide an ease to perform useful tasks that minimizes the less interaction with computers.

2. In some of the literature, the usage of audio communication is also proposed but this may create an overload and a confusion for rescuers as this system design is proposed to provide an easy way out for rescuers to set a priority to dig at particular places where one may find maximum chances to retain the live of a miner. Moreover, there are several systems, which are easy to carry, and wearable i.e. a wrist band using Arduino Platform for the rescuer.

The main objectives of various papers are related to generating an alert to rescue team using android applications but what rescue team will do if they do not know where the exact miner is lying beneath the debris. Discussing some of very sensitive solutions i.e. designing of incubators where data acquisition and transmitting that wirelessly both are challenging tasks but yet one may find various systems being designed on micro-controller based and receiving some of essential data.

Being an engineer, people expect us to provide a solution which should be under community services and due to this various research scholar strive hard to propose various solutions.

These solutions are majority proposed in the area where one sewer may go underground and clear the drain line. Discussing further one may see such autonomous systems which may not only detect the various gases using Average Slope Multiplication techniques.

In Proposed papers there are plenty of papers which will not only detect the gas leakage but recognize it as well i.e. Methane or any hazardous or poisonous gases which may harm the labour inside a drain line or in mines in our case.

The main issue in the establishment of such an underground monitoring system is to have a communication alive and in this regard one may explore the use of low frequency magnetic fields for communication, and present a new hardware platform that features triaxle transmitter/receiver antenna loops.

II. MAIN COMPONENTS

The hardware parts of the project include

- Power Supply circuit (consisting of Diode, LED, Capacitor, Voltage Regulator and Battery)
- Buzzer connected to Microcontroller (AT89C2051)
- Emergency Switch and Strain Wire connected to Microcontroller
- ESP8266 WIFI module
- E-Jacket
- Android Phone to connect mobile with the hardware part of the Jacket through wifi Module.
- Gps Module

Battery: -

1. Constant 9v Output till lasts
2. Metal Jacket Body
3. Good Built Quality and hence Leakproof
4. Easy to install and Replace
5. Corrosion-free Connector point for long-term use
6. 0% Mercury and Cadmium.Environment-friendly
7. OEM Compatible

Active buzzer: -

1. Product name:3.3 to 5V Active Buzzer Alarm Module Sensor
2. Transistor drive module uses 8550
3. With Fixed bolt hole-easy installation-2.6mm aperture.
4. Operating voltage 3.3V-5V
5. PCB Dimensions:34.28(L) * 13.29mm(W) *11.5(H)

ESP8266 WIFI Controller:

1. Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
2. Operating Voltage:3.3V
3. Input Voltage:7-12V
4. Digital I/O Pins (DIO):16
5. Analog Input Pins(ADC):1
6. UARTs:1
7. SPIs:1
8. I2Cs:1
9. Flash Memory:4MB
10. SRAM:64KB
11. Clock Speed:80MHz
12. USB-TTL based on CP2102 is included onboard,Enabling Plug n Play

13. PCB Antenna

ESP32CAM:-

1. Wireless Module: ESP32-S WIFI 802.11 b/g/n + Bluetooth 4.2 LE module with PCB antenna,u.FL connector,32Mbit SPI flash,4Mbit PSRAM.
   Camera: FPC connector,Support for 0V2640,Support for -0V2640 or OV2670 camera
2. Expansion:16x through-holes with UART,SPI,I2C,PWM.
3. Misc:Reset button.
4. Power Supply: 5V via pin header.
5. Power Consumption.
6. Flash LED off:180Ma@5V
7. Flash LED on to maximum brightness: 310mA @ 5V min.
8. Deep-sleep:20mA @5V min.
9. Modern-sleep:20Ma @5Vmin
10. Light-sleep:6.7Ma @ 5V min

Blink –App:-
A typical program used by beginners, akin to Hello, World! is "blink

", which repeatedly blinks the on-board LED integrated into the Arduino board.
This program uses the functions pinMode() , digitalWrite() and delay() , which are provided by the internal libraries included in the IDE environment.

III. METHODOLOGY

The proposed system is to design a portable device which resembles a normal jacket. It consists of WIFI microcontroller, WIFI/GPS modules, screaming alarm, LED modules and emergency switch. The prototype includes two independent system controlled using switch.

When switch is pressed the device will get activated, immediately the location of the victim will be tracked with the help of GPS and emergency message along with latitude and longitude value will be sent to stored contacts every one minute with updated location.

Simultaneously the LED module along with the screaming alarm unit will be activated. The LED module consists of high intensity LED's connected in series that will let out a flash which will make the attacker lose his veering for few seconds, while the alarm will send out sirens to call out for help. When second switch is pressed coordinates which can be used to find exact location using GOOGLE MAPS.

The project is powered by a 12V DC power supply, it consists of atmega8a microcontroller which is a 24 pin IC.

The circuit consists of two switches which functions differently to give different output and activate the circuit. The circuits include GPS, LCD,LED and buzzer.

The GPS module is connected to the RX pin of the microcontroller through its TX pin and sends the location via the GSM module .The GSM module which is connected to the TX pin of the microcontroller through its RX pin.

The output devices include the LCD, LED module and the buzzer .The LCD is used to show the longitude and latitude value which is not the part of end product. The two LED modules and the buzzer are used to grab attention of nearby people and throw the attacker off-guard.

When switch one is pressed all these feature i.e. location , LED modules and the buzzer start working simultaneously, and when switch two is pressed only the location is send to the emergency contacts.

Result:
In this system Push button is pressed alarm should ON. After pressing push button camera must ON and send the streaming to authorized person.
GPS module must send live location to authority.

- Advantages

1. Provides Safety in the critical conditions.
2. Live location can also be tracked by the Authorized persons.
3. System is compact and easy to carry in the Jacket.

- Disadvantages

1. Cost on higher side
2. Corrective action can't be taken immediately as the system has limited Functions

3. Mobile Network plays an important role in the Process

CONCLUSION

The women safety jacket allows immediate response and mainly focuses on different parts for protecting the women in distress, first is providing instant protection to the user by an alarming sound by using a buzzer. In the second part, the user can send real time location to the predefined numbers using GPS. Bluetooth transmits data serially. The main aim of designing this jacket is to implement a simple, reliable, comfortable and easy to carry device with magnanimous functionality for women which allows immediate response in case of harassment or assault providing protection in an affordable cost which can be easily endured by the common users.

The major limitation is power drainage due to continuously keeping the circuit on but we can also overcome this problem by using small size battery like wrist watch batteries or rechargeable batteries like mobile batteries this would make the system compact and light in weight.

A battery level indicator along with alarm can be used to notify women about battery condition so she can replace or recharge battery on time.

FUTURE SCOPE

By using image processing techniques fear, distress, anger of user can be analyzed using camera and other sensors and automatic alarm or message sending operations can be performed rather than manually pressing the emergency switch. In short by using digital image processing techniques the circuit can be made partially automatic. The setup can be made detachable for day-to-day using, so that the same setup can be used on different outfit.

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Automatic Green House Controlling Using Node - MCU ESP8266

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***Abstract* - Agriculture is the basic industry for economic growth and development. The growth in demand of crops is a result of a rapid increase in the world population. For growth and cultivation of crops, parameters including fields and growing condition of plants are vital. Farmers have usually applied regular strategies for all crops which have led to less yield for some specific crops. [1-3] These specific crops need specific conditions, and in this regard, smart agriculture management system can grow crops under specific conditions. Smart agriculture management system consists of monitoring and controlling of environmental variables monitoring either automatic or remote, based on ESP8266 Wi-Fi Module and IoT technology. Environmental variables including temperature, humidity, light intensity, air quality etc. can reflect the environment condition inside the greenhouse.**

These environmental variables can be monitored by using various environmental sensors placed inside the greenhouse which are managed as a Wireless Sensor Network (WSN). WSN is a network composed of nodes which transmit or receive data using wireless transmission technologies. WSN plays an increasingly vital role in constructing a smart agriculture management system because farmers require to capture the real-time environment data to develop an effective strategy for improving crop yields. These sensors can be powered and then used to transmit real-time data to ESP8266 which can then analyze and process the provided data. Wireless Sensor Network (WSN) can be connected to Internet using Wi-Fi Router, and then real-time data fetched by these sensors can be transmitted to IoT platform periodically[4,5]. Electronic devices with IoT technology are used increasingly nowadays such as smart television, refrigerator, washing machine, air conditioner etc., which can connect to internet and transmit data to users.

Keywords: ESP8266, Wi-Fi Module, Wireless Sensor Network (WSN).

I. INTRODUCTION

Agriculture is the backbone of Indian Economy. In today's world, as we see rapid growth in global population, agriculture becomes more important to meet the needs of the human race.

However, agriculture requires irrigation and with every year we have more water consumption than rainfall, it becomes critical for growers to find ways to conserve water while still achieving the highest yield. But in the present era, the farmers have been using irrigation technique through the manual control in which they irrigate the land at the regular interval. According to statistics, agriculture uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant in water consumption because of population growth and increased food demand. There is an urgent need to create strategies based on science and technology for sustainable use of water, including technical, agronomic, managerial and institutional improvements. Agricultural irrigation based on Internet technology is based on crop water requirement rules.

By using Internet technology and sensor network technology we can control water wastage and to maximize the scientific technologies in irrigation methods. Hence it can greatly improve the utilization of water and can increase water productivity. Nowadays water scarcity is a big concern for farming smart agriculture management system consists of monitoring and controlling of environmental variables monitoring either automatic or remote, based on ESP8266 Wi-Fi Module and IoT technology. It can provide suitable growing conditions for crops by adjusting environmental variables inside the green-house which can improve crop yields and meet the needs for crop growth. This project helps the farmers to irrigate the farmland in an efficient manner with automated irrigation system based on soil moisture.

II. METHODOLOGY

The main objective of this project is to provide an automatic irrigation system thereby saving time, money & power of the farmer. The traditional farm-land irrigation techniques require manual intervention. With the automated technology of irrigation the human intervention can be minimized.

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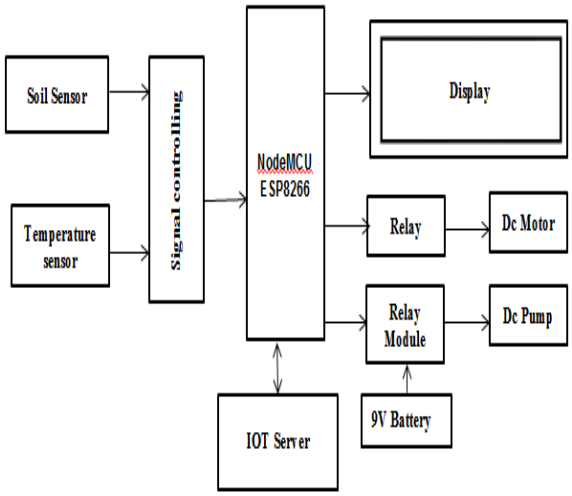

Figure 1: Block Diagram

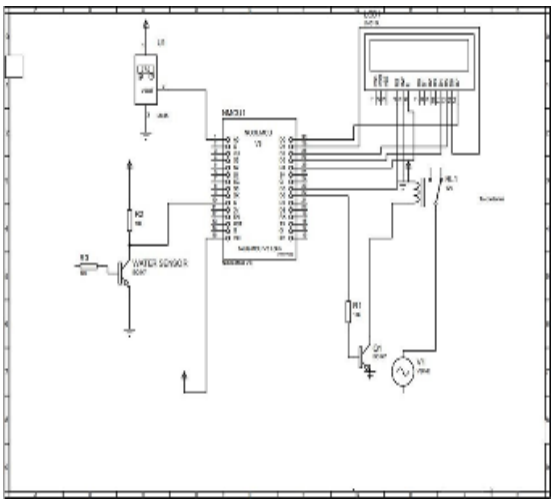

Figure 2: Cricket Diagram

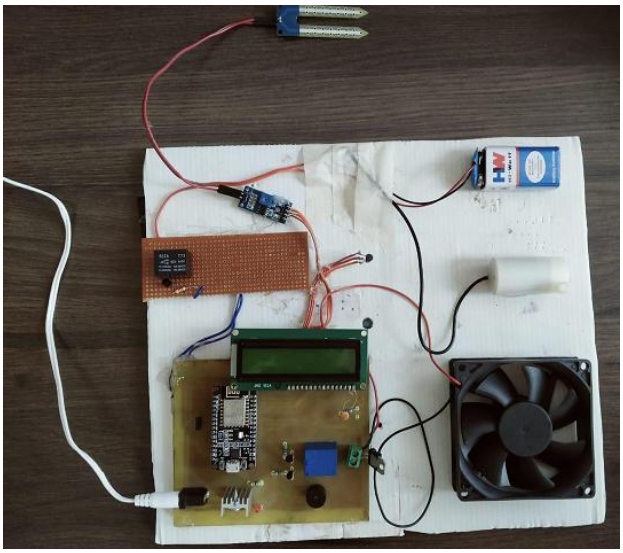

Figure 3: Hardware Implementation

III. RESULTS AND CONCLUSION

This greenhouse management system has low-cost characteristics and is suitable for indoor garden or small sized greenhouse. Moreover, it can be extended to reduce the labor cost in modern agriculture because it realizes the wireless remote control for greenhouses. It also provides efficient visual representation of the parameters of the internal greenhouse environment. Moreover, this management system facilitates users to remotely control the operation condition of the controllers established inside the greenhouse.

In the future, we will evaluate more environmental parameters (including water flow) for monitoring and will aim to implement system in modern smart agriculture field. The system has successfully overcome quite a few short coming of the existing system by reducing the power consumption, maintenance and complexity, at the same time providing a flexible and precise form of maintaining the environment.

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Manufacturing and Design of E-Vehicle from a Scrapped Vehicle

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***Abstract*: Due to the increase in the pollution and cost of fuels, there has been a need for alternate Vehicles (electric vehicles) to conventional Internal Combustion engine (ICE) vehicles. As electric vehicles are environmentally friendly, they are considered Green Transportation. Electric vehicle technology has become increasingly significant in a society where energy conservation and environmental preservation are growing concerns. Due to growing concerns about the effects of the Air Quality Index (AQI) and the greenhouse effect, some cities have designated zero-emission zones and tightened emission limits to promote the use of electric vehicles. Researchers, environmentalists, and other groups have paid close attention to eco-friendly electric cars (EVs) in recent decades, as concerns about the detrimental impacts of greenhouse gas emissions from conventional vehicles on global warming and air pollution have increased.**

To overcome these issues an idea to reconstruct an ICE vehicle with an electric motor as the main driving utility is implemented. For the same a custom swingarm is designed that could fulfil the requirement, for the construction of the swing arm various forces acting on the vehicle are considered to ensure the durability of the vehicle.

The vehicle has been powered by a 750W BLDC motor engaged with a wheel with the help of a chain and sprocket mechanism. The rider gives input through a throttle which is sensed and then required feedback is supplied to the motor through a controller.

Testing of the vehicle has been carried out on the ground in robust conditions to get the practical range, speed, and durability values of the vehicle.

Various components, such as the controllers, battery, and motor are incorporated into an electric vehicle. Because an electric vehicle's, conventional IC engine is replaced with an electric motor, the electric motor is the first and most essential part to choose when designing an electric car. As a result, an electric vehicle's motor must provide enough power and additional motor characteristics. The most important step is to select an appropriate motor rating for the load being transported.

***Index Terms*: BLDC motor, Controller, Electric vehicle, EV, Lead acid battery.**

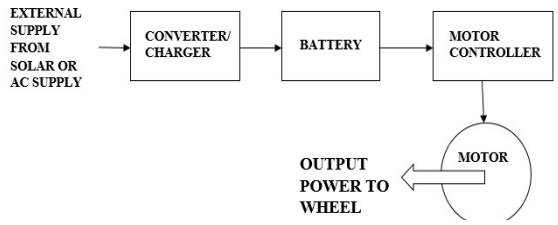
1.INTRODUCTION

The electric vehicle is one of the most promising technologies for potentially replacing fossil fuels, because of its many advantages, it also helps us to reduce the emission of harmful gases. It consists of many modules which play a vital role in EVs such as charging modules, converters, controllers, selection of batteries, and electric motor. The battery unit is used to supply electric power to the electric motor and the controller is used to control motor speed and regenerative braking. It helps in controlling the input and output parameters.

An electric car operates on a fundamental scientific principle: energy conversion. Electric energy is converted into mechanical energy. A motor in the electrical system performs this conversion duty. There are many dissimilar types of motors. The motor of an EV is similar to that of an internal combustion engine. In electric cars, the foremost source of power is motors. It is extremely significant in electric vehicles. There are many different types of electric motors, but due to significant advancements in the field of power electronics and control techniques, numerous types of electric motors can now be employed in electric vehicles. High starting torque, density, good efficiency, and high power should be features of electric motors utilized in automobile applications.

The electric car is one of the most promising future technologies for lowering fossil fuel consumption while simultaneously being ecologically benign by minimizing hazardous gas emissions. The charging module, converters, controllers, batteries, and electric motor are all components of an electric vehicle, and the block diagram of power flow in an electric vehicle is depicted in Figure.

2.BLOCK DIAGRAM



3. OBJECTIVE

- To convert an Internal combustion engine vehicle (ice/pollution causing vehicle) into electrical vehicle
- To design and develop an electric vehicle from a scrapped ICE vehicle.
- To study the working of ICE.
- To research, select and purchase appropriate motor and battery for the vehicle.
- To design a swing-arm that is able to sustain various forces that are acting upon it and is able to full-fill the requirements for the mounting of motor.
- To effectively adjust the batteries while maintaining the overall balancing of the vehicle.
- To integrate motor and battery using proper controller.

4. PROBLEM STATEMENT

The technologies for global transportation are dominated by internal combustion Engine-powered vehicles that lead to a major threat to green gas emissions, even though the global transportation technology partially moved to Hybrid fuels and battery electric vehicles. These technology improvements are not attracted global customers because of their cost and their compatibility. Our aim is to rebuild an Internal combustion engine vehicle into Electric Vehicle that would meet the requirements of one person driving the vehicle.

5. METHODOLOGY

1. Methodology Internal combustion engine vehicle analysis, including dimensions, mass, drive type, and other ICE vehicle data.
2. Motor research, selection, andpurchase: To calculate appropriate motor considering the mass, of the system and considering various resistance (rolling, gradient) and drags(aerodynamic).
3. Battery research, selection, andpurchase: To select the appropriate battery for the system considering the motor specifications, required range, and speed of the vehicle.
4. Removing of fueltank, IC engine and,Assembling of the motor, and battery to electricvehicle

6.MAIN COMPONENTS

In EV, Electrical motors are similar to IC engines in IC-engine vehicles and the vehicle's heart is the electric motor. Electric energy to mechanical energy conversion is done by using an electric motor. When a driver of an electric vehicle hits the accelerator, the car's battery sends electricity to the stator via the controller, which causes the rotor to spin, and then mechanical energy to the wheel via the shaft and chain system.

A] CONTROLLER

The controller is used to connect the E-bike and all the electrical components of the E-bike. Electric bikes have two main electrical components connected between the battery and the motor. The EV controller is connected to electrical and electronic components such as the battery and throttle Element (if any), speedometer, and motor. It also includes three Hull sensors to be the position sensors that send the position signals of the motor rotor to the LO port of the Controller

The controller transmits PWM signals and controls the output current of the motor via the duty factor of the PWM inverter, and accordingly, it will control the speed of the motor. Throttle input is analog in nature which is a sense by the controller and makes it acceptable. An e-bike controller receives information from the battery, motor, accelerator, and pedal-assist systems, and then return the correct signals to the electronic or electrical parts of a system of motor. The voltage provided to the motor can be adjusted, from 0V to the rated voltage of the entire battery pack, Responding to the user's accelerator signal, pedal sensor, and various current limits.

It is important to select a motor controller that matches the power rating of the motor used and the battery voltage. With the help of a throttle, it allows controlling the power of the motor.

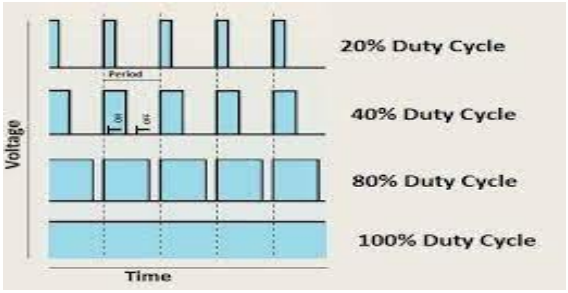


Fig. 6.1 PWM Wave

b] GEAR AND CHAIN:

Energy is required to drive the machines and equipment for a variety of applications. Available power is required to be transmitted to get the desired motion and work. When power is transmitted from the input device to the output device using mechanical elements is known as mechanical power transmission. Mechanical elements like the friction disc, various types of rope, belts, chain, gears, couplings elements, etc. Or transmission of power. In the drive, the energy is transferred by using a chain drive, where input supply is to be obtained by the BLDC motors shaft and output to the
Vehicle's sprocket.

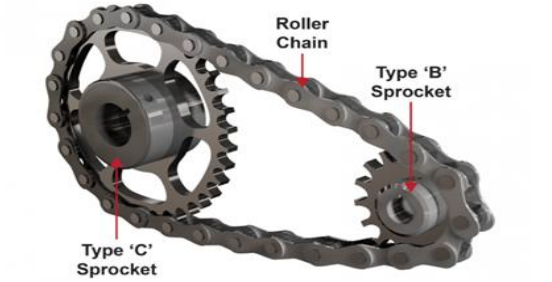


Fig. 6.2 Chain drive

Advantage of Chain Drive:

- In chain drive no slippage occurs.
- In chain drive velocity ratio remains constant. So, the chain drive is one positive drive. However, the polygonal effect can lead to non-uniformity in speed.
- The efficiency of the chain drive is more than 95 percent.
- It is generally not affected by environmental temperature and conditions.
- Regular/periodic maintenance requires in Chain drive Ex. Lubrication.

C] MOTOR

I] DC Motors in Series

Other DC motors in comparison to DC series motors have a strong starting torque, making them a good choice for traction applications. It was the most extensively utilized traction motor at the time. This motor's benefits include easy speed control via various techniques and the ability to tolerate a rapid rise in load. All of these features make it a magnificent versatile motor. Due to brushes and commutators, the fundamental disadvantage of DC series motors is their high maintenance. Railways employ these motors. This motor belongs to the DC brushed motor category.

II] BLDC

It's almost identical to permanent magnet DC motors. Because it lacks a commutator and brush arrangement, it is referred to as brushless. BLDC motors do not require any maintenance. High starting torque and efficiency are fundamental properties of BLDC motors. BLDC motors are well-suited to high-power density design. Due to their traction properties, BLDC motors are the most recommended motors for electric vehicle applications. By contrasting BLDC motors with traditional brushed motors, you can learn more about them.

D] BATTERY :

The storage battery is a battery where the energy can be stored in the form of chemical energy and then converted into electric energy at the time of discharge. The conversion of electrical energy into chemical energy by applying an external electrical source is called as charging process of the battery. Whereas conversion of chemical energy into electrical energy for providing the external load is known as discharging of the storage battery. During charging of the battery, the current is supplied to it which causes chemical reactions inside the battery. during the formation, the energy is absorbed due to chemical changes. When the battery is connected to the load, the chemical reactions take place in a reverse direction, during which the absorbed energy is discharged as electric energy and provides power to the load.

E] V2G:

The term "vehicle2grid" refers to a system that permits energy from an electric car's battery to be returned back to the grid. A car rechargeable

battery discharged based on the multiple indications, such as energy generation or consumption locally, is known as electric vehicle2grid technology.

F] THROTTLE

The electric bike's throttle is an entirely twisted throttle that must be used with one's hands. The whole end of the handlebar is occupied by the completely twisted throttle. To control the throttle, the rider just grips it and bends it back towards himself. Many people like full accelerators because they can be operated entirely with the hand's five fingers. The working principle of the accelerator depends on the Hall effect. An internal combustion engine's throttle valve is difficult to calibrate, while an electric vehicle's software may be customized in any way. The various throttle settings available for electric vehicles can assist in making the vehicle seem firm when driving.

7. FUTURE SCOPE

- Regenerative braking: we can use regenerative braking to store mechanical energy while we apply the brake. In mountainous places or where brakes are used frequently, such as on city trips, regenerative braking will be more useful. Future work needs to identify the percentage of recoverable energy, the impact of efficiency, cost, and the reduction of dependence on battery technology.
- Battery: we can upgrade the battery to the lithium-ion battery
- Solar panel: To charge the battery simultaneously we can use the solar panel to charge the battery which arise higher efficiency.
- Vehicle-to-grid: Vehicle-to-Grid is a bi-directional interaction between an electric vehicle and an energy distribution grid.

8. CONCLUSION

The working of the ICE engine is studied, based on research and calculations done the vehicle is employed with a 750W BLDC motor and a Lead-Acid battery pack with a capacity of 48V 14Ahr. A custom swing-arm with a motor mounting space is designed using tools like AutoCAD and blender and the batteries are properly placed in the vehicle. Motor and battery are interlaced through a charge controller and are calibrated. A fully functional E-Vehicle is manufactured and designed from a scrapped vehicle.

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Monitoring Parameters of Motor Using Wireless Communication

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***Abstract*—** Automation is using diverse manage structures for running system which include machinery, strategies in industries which include boilers and warmth treating ovens, switching on phone networks, guidance and stabilization of ships, plane and different programs with minimum or decreased human intervention. This studies paper gives superior techniques the usage of wi-fi tracking machine for induction motor primarily based totally on Internet of Things (IoT) for secure and monetary facts communication. n the primary approach, kingdom of the artwork fault detection approach is exhibited for induction motor. This studies paper relies upon at the evaluation of measured voltage, current, earth leakage, rotor repute and speed. Progressed embedded approach and applied to isolate and survey the frustration seriousness. In this procedure, exclusive sensors are related to the motor, and the portions are extracted via way of means of using a microcontroller. The Graphical User Interface (GUI) with cloud server IoT is used to transmit the facts from base station to far flung station. This association permits the customer to interface with the framework. The proposed studies paper primarily based totally induction motor manage machine is verified via the simulation in Raspberry Pi three environment.

Automation has end up a primary want for rising technologies. Motors are the nerves of many industries. Hence Industrial automation is needed for specific and correct operation. This assignment proposes a wi-fi manage and tracking device for numerous commercial machines primarily based totally on Zigbee verbal exchange protocol for secure and financial records verbal exchange in commercial fields in which the stressed verbal exchange is greater pricey or not possible because of bodily conditions. Sensor module is used to display the parameters of any commercial system and transmit the records thru Zigbee Protocol. In case of fault withinside the foremost system, the controller examine the records from sensor and routinely sends sign to the alarm circuit and relay circuit which switches to standby system and additionally video display units the parameters. ARM processor primarily based totally device is used for amassing and storing records and as a result transmits the data to the manage room thru pc interface and shops the records periodically. A prototype and simulink version is advanced and examined to affirm the overall performance of this proposed device.

I. INTRODUCTION

The present computing technological know-how is free from conventional computing restricted to laptop computer or Laptop. Now, it‟s rising and entails sensible devices which includes machines, infrastructures, environment, gadgets and peripherals for client utility at every day use etc. which would possibly be interconnected via the net, Gubbi et al. (2013). Earlier Internet became into actually limited to records interchange among man or woman and set of clients can be close by or throughout global, then again now Internet goes to revolutionise the humanity. The final motive of the internet is to offer the speedy, applicable information about the authentic world applications and the gadgets Aggarwal et al. (2013). With non-stop developmental and analytical studies primarily primarily based completely approach internet software program and utilities have waxed up, going previous the speculation of the human mind; and as a final result ensuing withinside the commencing of IoT (Internet of Things). The global connection of shrewd devices is referred as IoT which in particular interests at connecting the most of the day-nowadays no longer unusual location in hand tools and units over the internet that may specially serve the advantage of

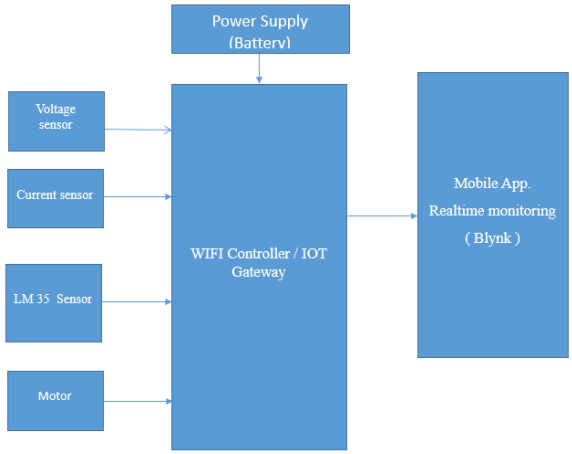
assembly comfort, luxury, and a kind of buttress to disabled, aged The ultimate cause of the prevailing seem at is to indicate a mechanism which ought to reduce the electricity consumption and preserve the greater electricity of motor for in a similar fashion use. The thesis makes a speciality of the discount of electricity consumption at an persona dwelling and in a massive public community which consists of rural areas. In addition, the thesis additionally affords with the have a look at of the water irrigation issues that the wastage of water may be reduced. To fulfil the objective, following 3 modules had been proposed. The modules had been designed in preserving up view with important aspects and fixing the priority on the three discreet tiers i.e.

- The domestic and commercial level that includes residential locations such as hotels, houses , work vicinity (offices) and so forth
- Major are overlaying up a city, a city etc.. • The rural and bucolic vicinity where irrigation practices are followed and traffic density are very much less or occasional

II. METHODOLOGY

The main and controlling unit isESP8266 and behaves as the central unit for the whole system, its interfaces which connected with the sensor at the input end for gathering current readings and interfaces which connected with the wireless module at the output to transmit the sensed information towards Blynk using Internet. The wifi module polls the sensor to retrieve information and transmits using the Internet to blynk application.

- Block Diagram:

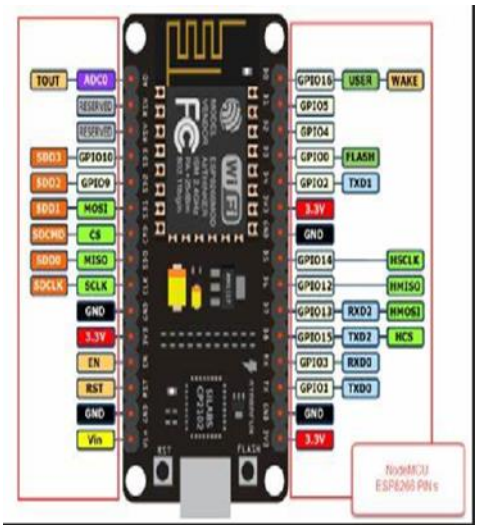


- Working

The block diagram of proposed system consist of sensors which are mount on the motor to measure the voltage, current, speed, temperature of the motor. All the measured values are send to microcontroller where it is process and encrypted packet are formed. This packet are transfer to server via wifi module which is mounted in the system. The data available at server can be access by a wed desktop or mobile app(Blynk app).

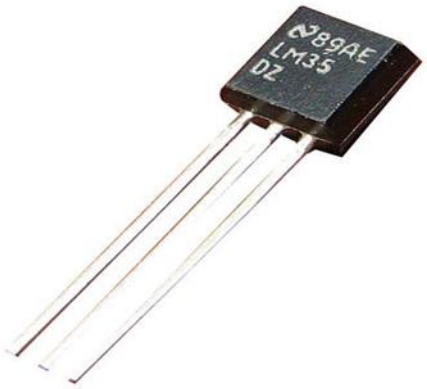
- Hardware:

4.1 ESP8266



The NodeMCU ESP8266 enchancment board comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor helps RTOS and operates at 80MHz to a hundred and sixty MHz adjustable clock frequency.

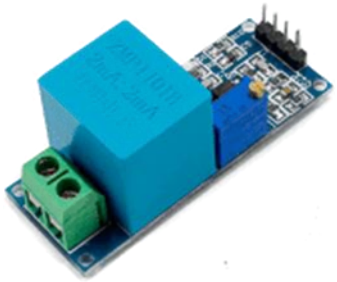
4.2 LM35



This Sensor operates on 5V DC Supply and sends the Signal to IOT Gateway about the Body Temperature . It is an Analog Sensor that Sends the Live Data to the Controller

4.3 Voltage Sensor

The Voltage Sensor is a on hand module which may desire to used with Arduino (or some specific microcontroller with enter tolerance of 5V) to degree outdoor voltages which are increased than its most applicable cost i.e. 5V in case of Arduino. Following is the image of the Voltage Sensor Module used on this project. In our Project, the Voltage Sensor consistently video display units the Line Voltage of the Battery and sends the Data to the Dashboard



4.4 Current Sensor

This sensor operates at 5V and produces an Analog voltage output proportional to the measured contemporary. The output of this contemporary sensor is analogy, to be able to examine it, we are able to at once degree the output voltage the usage of voltmeter or degree it via way of means of the usage of a microcontroller like Arduino through Analog Read pin or ADC In our Project, the Current sensor will continuously reveal the Current.

4.5 Dc Motor

12v DC

4.6 SOFTWARE

Blynk App

It is the Open Source IOT Cloud Platform that Accepts the Data from NodeMCU and its sensors and may moreover control the Load (Output Devices) This is connected to the Hardware by Mobile App. Blynk is a manufacturer new platform that lets in you to fast construct interfaces for controlling and tracking your hardware obligations out of your iOS and Android device. After downloading the Blynk app, you may additionally desire to create a mission dashboard and set up buttons, sliders, graphs, and exceptional widgets onto the screen. Blynk App - lets in to you create gorgeous interfaces on your tasks the use of severa widgets we provide. Blynk Server - reliable for all of the communications amongst the cellular phone and hardware. You can use the Blynk Cloud or run your private Blynk server locally.

III. RESULT

The mechanism was tested on a DC motor as well as AC motor and the parameters were monitored and was crosscheck by using voltmeter, ammeter and there was accuracy of 90% from the above system.

CONCLUSION

The conclusion of this task is that we can use ESP Controller to manage the System besides Human Interference and can even screen the System on Mobile App.Various Functions can be delivered to make the device more greatest and reliance for business use

ADVANTAGES

No Human required for this Operation Large profits can be made by Owner Simple and efficient Compact Design

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Transmission Line Cable Fault Distance Identifier over Internet of Things (IOT) Platform

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Abstract - **The objective of this project is to determine the distance of Transmission line cable fault from base station in kilometers. The Transmission line cable system is a common practice followed in many urban areas. While a fault occurs for some reason, at that time the repairing process related to that particular cable is difficult due to not knowing the exact location of the cable fault. The proposed system is to find the exact location of the fault and the information has to be sent to the user mobile phone by using IOT module. The project uses the standard concept of Ohms law i.e., when a low DC voltage is applied at the feeder end through a series resistor (Cable lines), then current would vary depending upon the location of fault in the cable. In case there is a short circuit (Line to Ground), the voltage across series resistors changes accordingly, which is then fed to an ADC to develop precise digital data which the programmed microcontroller of Arduino Uno family would display in kilometers.**

The project is assembled with a set of resistors representing cable length in KM's and fault creation is made by a set of switches at every known KM to cross check the accuracy of the same. The fault occurring at a particular distance and the respective phase is displayed on a LCD interfaced to the microcontroller. Further this project can be enhanced by using capacitor in an ac circuit to measure the impedance which can even locate the open circuited cable, unlike the short circuited fault only using resistors in DC circuit as followed in the above proposed project.

Keywords: DC circuit, LCD interface, IOT module, Transmission.

I. INTRODUCTION

This project is to determine the distance of Transmission line cable fault from base station in kilometers using an Arduino board. Many time faults occur due to construction works and other reasons. Cables have some resistance. We are mainly focusing that resistance. Resistance can vary with respect to the length of the cable. If the length of the cable is increase, the value of the resistance will also increase. If any deviation occurs in the resistance value, we will call that is fault point and finding that place through Arduino technology. That fault point represents the standard of distance (kilometer) from the base station. This value displayed by display unit. Before attempting to locate Transmission line cable faults on cable, it is necessary to know where the cable is located and what route it takes. If the fault is on secondary cable, knowing the exact route is even more critical.

Since it is extremely difficult to find a cable fault without knowing where the cable is, it makes sense to master cable locating and tracing and to do a cable trace before beginning the fault locating process. Success in locating or tracing the route of electrical cable and metal pipe depends upon knowledge, skill, and perhaps, most of all, experience. Although locating can be a complex job, it will very likely become even more complex as more and more Transmission line plant is installed. It is just as important to understand how the equipment works as it is to be thoroughly familiar with the exact equipment being used.

II. METHODOLOGY

Use of underground power cable is expanding due to safety considerations and enhanced reliability in the distribution systems in recent times [5] . Due to safety reasons and high power requirements in densely populated areas, use of underground cable has seen a sharp hike. The underground cable systems have the advantages of not getting affected by any adverse weather condition such as storm, snow, heavy rainfall as well as pollution. But it has its own drawback for immediate tracking of fault in the underground cable lines.

Study of cable failures and development of accurate fault detection and location methods has been interesting research topics in the past and present. Fault tracking entails determination of the presence of a fault, while fault location detection includes the determination of the physical location of the fault. However, this fault detection and fault location detection technology for underground power distribution

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systems is still in developing stages.[6] Before fixing any fault in cables, the fault has to be identified first. There are many ways to find the cable fault location. This paper deals with the method to locate faults and identify the phase line in damaged cables. A basic idea of fault location and phase identification in the pictorial view is undernoted.

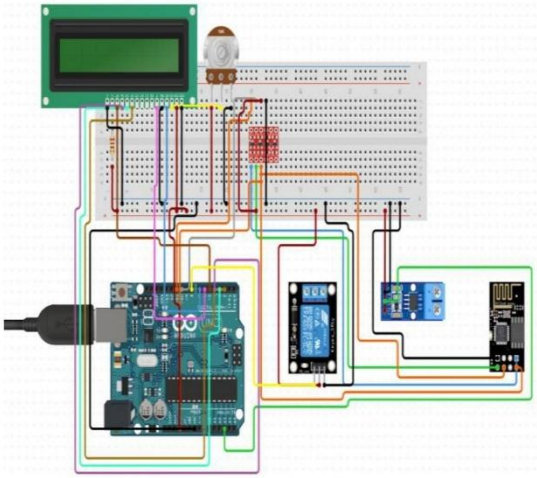

Figure 1: Circuit Diagram

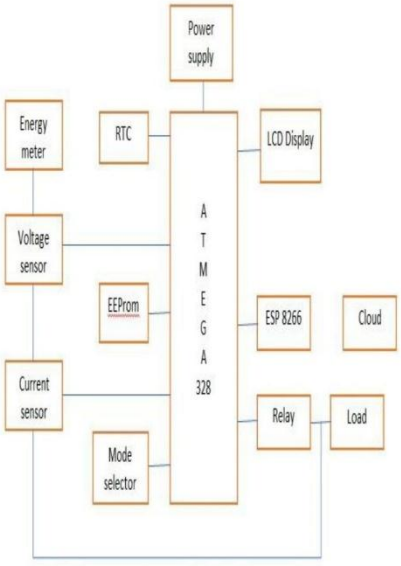

Figure 2: Block Diagram

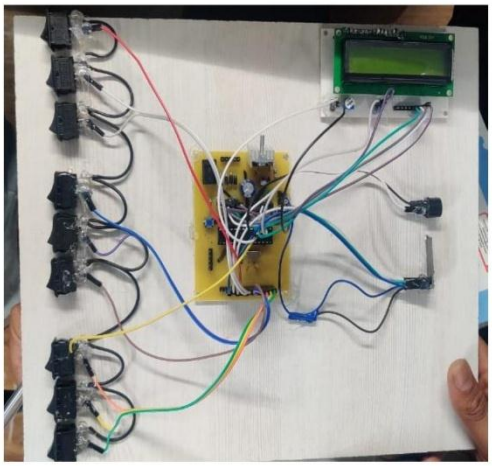

Figure 3: Hardware Implementation

III. RESULTS AND CONCLUSION

Thus the project on Transmission line cable fault detection using Arduino was done and the distance of the fault from the base station in kilometers was displayed for the three individual phases R,Y and B. Circuit can be tested with different resistor values to simulate various fault conditions In this project faults up to a distance of 20km can be detected. When the fault switches are operated to fault condition then the phase corresponding to that particular switch is considered as the faulty phase. So the faulty section can easily be located.

In this paper we detect the exact location of short circuit fault in the Transmission line cable from feeder end in km by using Arduino. In future, this project can be implemented to calculate the impedance by using a capacitor non AC circuit and thus measure the open circuit fault.

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APPENDIX A4

PUBLISH PAPER

Islanding Scheme for Microcontroller Based Load Frequency Controller

Ms. Suchita V. Patil[1], Ms. Sayli M. Surve[2], Ms. Sayali A. Patil[3], Ms. Maheshwari M. Babar[4].

Student, Department of Electrical Engineering, AISSMS IOIT Pune, India

***Abstract*: This paper is for detecting power sync errors. The actual power grid consists of power sources that are synchronously connected to power the system. These power supplies must be powered according to grid rules. These rules include voltage and frequency fluctuations within certain limits. Deviations from these limits require that this data source be immediately disconnected from the network and affected. This is known as solo operation. It is used to avoid large voltage drops or power outages from the grid. Our system is designed to warn the network of a power failure, so the network can use other backup data sources as needed to avoid a complete power failure. Our system demonstrates this with the ATmega328P microcontroller. MC is used to detect voltage and frequency from a set of comparators. Since the frequency cannot be changed, use the frequency generator (555 timer). Standard variacs are also used to vary the input voltage of the system. Normal loads are used to indicate the expected power outage or power outage if the voltage / frequency deviation exceeds the limit.**

Keywords: Synchronization, Islanding, Voltage and Frequency etc.

I. INTRODUCTION

Synchronization means the minimization of difference in voltage, frequency, and phase angle between the corresponding phases of the generator output and grid supply. An alternating current generator must be synchronized with the grid prior to connection. It can't deliver the power unless it is running at same frequency as the network. Synchronization must occur before connecting the generator to a grid. Synchronization can be achieved manually or automatically. The purpose of synchronization is to monitor, access, enable, and automatically take the control action to prevent the abnormalities of voltage and frequency. There are some situations where the generators and some local loads have become disconnected from main distribution lines. Due to this reduction in quality of supply, and it may prevent automatic reconnection of devices. This is called as islanding. For this reason, islanding must be detected immediately and producing power must be stopped immediately. Detection of islanding can be done through active and passive methods. Passive methods look for transient events on the grid and active methods will probe the grid by sending signals from the distribution point of grid. The project is built on the microcontroller ATmega328P. By using set of comparators the microcontroller monitors the lower and higher voltage. The project uses a flexible frequency generator (555-timer) to change the frequency, while potentiometer is used to change the input voltage to evaluate project performance. The light load (indicating predictable shutdown, brownout) is operated from a controller. In the case of power or frequency output from an acceptable range. If the voltage and frequency exceed the limits it will affect the grid and cause grid failure. This feed unit is completely separated from the grid that creates the island's in order to maintain the necessary alignment between the grid and the feed unit.

II. BLOCK DIGRAM

230V power is supplied to the step-down transformer. The rated power of the transformer is 12V. You can use a rectifier consisting of a rectifier, a filter, and a voltage regulator. can use a rectifier consisting of a 3 rectifier, a filter, and a voltage regulator. The rectifier converts alternating current to direct current, and the filter blocks the ripple to provide a pure direct current signal. The DC voltage is further regulated and the microcontroller receives this DC voltage from the rectifier. The output of the microcontroller is connected to a 16x2 LCD display. The voltage can be changed by changing the voltage potentiometer. Variable frequency is taken from the 555 timers to test the functionality of the project. If you want to run load tests for proper synchronization, connect a 10W heavy duty lamp to a light load LED. The pot is connected to the input of the microcontroller. When you change the potentiometer, the voltage changes, and after reaching the allowable voltage, the voltage is displayed on the LCD. The relay circuit opens and the grid is protected. The frequency change is displayed before triggering. The light flashes before it goes out.

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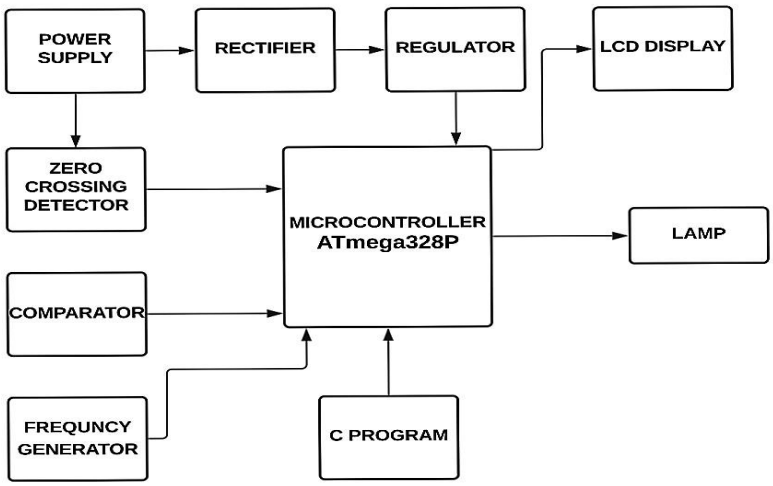

Fig. 1. Block Diagram

III. IMPLEMENTATION

Alternate power supply synchronization error recognized by this system Will be done. The error can be either under/ overvoltage or under/ over frequency. The system uses the ATmega328P microcontroller to execute this operation. This process is generally known as Islanding.

A. Voltage Sensing Part

Microcontroller is connected to zero voltage detection circuit and confirms that the frequency of the power supply is the normal frequency of 50Hz. VARIAC is used to get variable voltage. VARIAC is set so that the AC input voltage exceeds the normal value. The microcontroller sends a high logic pulse to turn on the relay driver. This will turn on the relay and turn on the light when AC power is received. likewise, if VARIAC is set to be lower than normal at some point in the input AC voltage. When microcontroller receives this break in, it sends a logic high signal to the relay driver to turn on the relay and the lamp begins to light.

B. Frequency Sensing Part

VARIAC is set to the normal value of the AC input voltage. The pin of the microcontroller is connected to the output of the timer via an NPN transistor. The timer operates in stable mode produces a signal with a frequency that can be conformed with variable frequency. This output is connected to the microcontroller's internal timer, which calculates the frequency of the pulse consequently and uses a relay driver if the frequency of the pulse is above or below normal frequency. Is actuated, the relay is turned on, and AC power is applied to the light. The lamp will start to light. 4. WORKING: Islanding of grid is principally to manage two parameters. One parameter is voltage and different parameter is frequency. Since we can not change the frequency, we've taken a 555 timer in a free running astable mode, the frequency of which can be varied by .R. We know that by the R & C combination, the multivibrator mode of the 555- timer output can be generated at different frequencies. This output is given to the MC leg which has the provision of changing the frequency 48Hz-52Hz by varying R as explained over through selector slide switch So, the MC will get will get the changed frequency. This is the reason why we use a 555 timer for giving precisely 52Hz or 50 Hz or 49 Hz which must be tested by the program. In the program it's so written that if the output from 555 timer which is fed to the MC goes to below 48 Hz or above 52Hz the corresponding outputs of MC will go high, which will affect in switching "ON or OFF" a lamp to indicate that the islanding has taken place. As far as the voltage is concerned, we've taken 2 comparators. Both the comparators are given to i.e., one for inverting input and other for non- inverting input which are given at a particular voltage. They are so set that the output of these two comparators going to MC pin remain high for low voltage and for the high voltage it's held low. So, when the input voltage changes at Rs which is a remedied voltage which is coming from the DC voltage, when the input voltage changes i.e., if goes high. (It given a high command) and if it goes low (it gives a low command) to the microcontroller. That's how the commands are handled by microcontroller.

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IV. RESULTS AND DISCUSSION

After the completion of hardware and software observed the following results: After testing system, we have observed lamp indication based on voltage stable and unstable state on voltage ranges:
After testing system, we have observed lamp indication based on voltage stable and unstable state on voltage ranges:

Voltage (V)	Lcd Display	Lamp Indication
<230	low voltage	on
230-240	stable voltage	off
>240	high voltage	on

Table. 1. Voltage ranges

After testing system, we have observed lamp indication based on frequency ranges:

Frequency (Hz)	Lcd Display	Lamp Indication
<48	display frequency	on
48-52	display frequency	off
>52	display frequency	on

Table. 2. Frequency ranges

Fig. 2. High frequency condition

Fig. 3. High voltage condition

Fig. 4. Low frequency condition

V. CONCLUSIONS

The paper elaborates the idea of developing a system for detecting the synchronization failure of any external supply source on the power grid when it detects abnormalities in frequencies and electrical power. There are several power supply units connected to the grid such as hydro, thermal, solar, etc. to provide power to the grid. These are need to supply power according to grid rules. These rules include maintaining variability of volage within limits and frequency. If any deviation from the acceptable grid limit is mandatory that the same server should be automatically disconnected from the grid called islanding. It is best to have a system that can alert the grid well in advance so that other arrangements can be kept in place to avoid grid failures.

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Solar based wireless EV charger

Prajakta Pawara[1], Shweta Deokate[2], Archana Dighule[3], Rutuja Swami[4]
[1,2,3,4] *Electrical Engineering, All India Shri Shivaji Memorial Society, Institute of Information Technology*

***Abstract*— In today's drastically deteriorated environment, electric vehicles (EVs) are required. India's government intends to have only electric vehicles by 2030. Fast charging of electric vehicles and charging infrastructure are required to make EVs widely accepted, as charging time is the primary obstacle to EV adoption. Having an acceptable charging infrastructure is a crucial aspect of this change. With the widespread use of electric vehicles, the current power supply may experience significant instability. The "solar-based wireless EV charger" project uses renewable energy technology. Solar energy is converted to electrical energy, which is then stored in a lead-acid battery. With the battery management unit, a wireless charging system will be established. This stored energy is utilized to charge Electric Vehicles.**

Index Terms: **wireless power transfer module, reverse charging protection, ATmega328P.**

INTRODUCTION

To improve charging station efficiency, electric vehicles will be the future mode of transportation. Electric vehicle charging will play a significant role in raising EV demand in the market; the lack of charging infrastructure is the primary reason for not purchasing an EV. We investigated the portable EV charger by reducing charging time with renewable energy. The vehicle battery charging station developed in this work uses a hybrid power system to give a unique service to travelers who seek to travel long distances in an electric vehicle. There are no electric charging stations for such users in between motorways to recharge their vehicles. For charging their electric vehicles, the wireless EV charger is the ideal alternative.

METHODOLOGY

Solar power has increasingly become popular over the past year. With its uncountable improvement and cost-effective ways, more and more people are opting to switch over to solar energy rather than their regular form of energy. Solar charging is based on the use of solar panels for converting light energy into electrical energy (DC). The DC voltage can be stored battery bank. There is Reverse charging protection circuit is provided for the backflow of energy from the battery to a solar panel. The transfer coil is located at charger side and receiver coil is placed on vehicle side. A wireless power transfer module (WPT) is used for transferring electric power which is generated from the solar panel to the Electric vehicle by using the principle of Electromagnetic Induction. To measure battery voltage, a voltage sensor is used. The battery voltage will be measured by microcontroller & showed on a 16x2 LCD. It will also display battery low status, whenever battery voltage falls below a certain level. L239D is the motor driver which is used for movement of wheels of that vehicle.

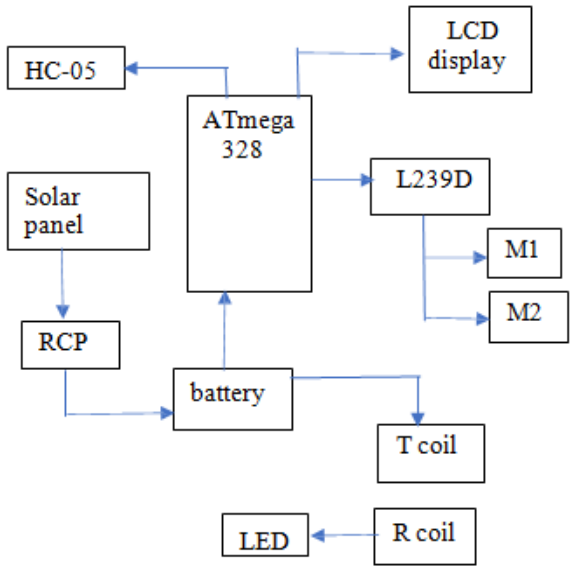

Fig.1 Block diagram of solar-based wireless EV charger

Wireless power transfer module (WPT): In electric vehicles charging of battery through a charger and wire is inconvenient, dangerous, and expensive. The existing gasoline and petrol engine technology vehicles are responsible for air, and noise pollution as

well as for greenhouse gases. The implemented wireless charging system of batteries for Electric vehicles by the inductive coupling method has been studied in this paper. The transmitting circuit is used between the transmitter coil & receiver coil where MOSFET is used for switching operation. The system is achieving a 61% efficiency level while providing safety, reliability, low maintenance, and long product life. This is easy to use Wireless Power Transfer Module. This module consists of Transmitter Section & a receiver Section. Both the sections have a coil that acts as a transmitting/receiving antenna. This product can be used for wireless charging of mobile phones and various small electronic products. It is in a very small form factor and is extremely easy to use efficient & low costing. It can be used for wireless charging of your product thus making the product completely sealed, dustproof & waterproof thus increasing your product's life.

Fig.2 wireless power transfer module

Specification:

- Transmitter Module Input voltage: 9-12 Volts
- Receives the output voltage: 5V
- Receiving the output current: 350-500mA
- Receiving usual distance: 3cm- 4cm

Due to the limited availability of resources, it has become essential to develop different methods to generate approaches to noiseless, cost-efficient, and convenient charging. It is estimated that losses incurred due to wires are about 20-30%. Hence WPT attempts to minimize these losses along with a reduction in pollution levels caused due to resources used presently. But for electric vehicles, traveling range and charging process are the two major issues affecting their adoption over conventional vehicles. The method of dynamic wireless charging allows keeping the vehicle charged while running. To overcome the problem of the charging process, a wireless charging & battery management unit for an electric vehicle is designed. The basic working principle of inductive WPT Charging is that there are two parts to the inductor. The primary winding is at the charger side and the other secondary winding is placed at the vehicle side. If an EV vehicle is stopped on the road because of battery is dead and there is no charging station around it then a movable charger is the most suitable method for charging that vehicle at that place with less effort and without wasting our time.

Reverse charging protection (RCP):

Many batteries powered applications use diodes for reverse battery protection. However, a diode does not always protect a battery charger.

Fig.3 reverse protection circuit

Sometimes when the battery is fully charged from the solar panel then to have proper protection, inserted backward it can cause a large amount of current to flow through the charging circuitry, possibly destroying both the battery and solar panel. A diode and resistor are placed in series with the battery. The diode in series with the main supply is to block current from the battery into the solar panel. Two resisters are in series with the battery to prevent reverse charging.

ATmega328 Arduino: A microcontroller is the heart of every automation system. It is a small, low cost and self-contained on- chip computer. Microcontrollers usually must have low-power requirements since many devices they control are battery- operated.

Fig.4 ATmega328P

The following parameters are mainly conceded for microcontroller selection:

- Number of input-output pins
- Amount of memory required
- Need for inbuilt ADC & DAC
- Processing speed & capacity
- Power requirement for operation
- Programing language
- Software & hardware tools required

As per our requirements, the microcontroller ATMEGA328P matches perfectly. ATmega328P is a high-performance yet low- power consumption 8-bit AVR microcontroller that can achieve the most single clock cycle execution of 131 powerful instructions thanks to its advanced RISC architecture. It can commonly be found as a processor in Arduino boards such as Arduino Fio and Arduino Uno. ATmega328P is one of the high-performance AVR technology microcontrollers with a large number of pins and features. It is designed with 8-bit CMOS technology and RSIC CPU which enhance its performance and its power efficiency get improved by auto sleeps and an internal temperature sensor. This ATmega328P IC comes with internal protections and multiple programming methods which helps the engineers prioritize this controller for different situations. The IC allows multiple modern era communications methods for other modules and microcontrollers themselves, which is why the microcontroller ATmega328P usage has been increasing every day.

CONCLUSION

Transportation is a major concern in the development of any country. Whereas electric vehicle is the future of the transportation industry. While a lot of research has been done on this topic in the previous decade, a large part of it is yet to be explored. From our project, we conclude that a wireless charging system is implemented by our group. Along with this, a battery management unit is designed, which shows the battery voltage. Battery voltage is measured by the microcontroller & displayed on a 16x2 LCD. We have used inductive coupling technology for wireless power transfer, but it is useful only for low power applications and where the distance between receiving and transmitting coils is less. But for real-world applications, the power requirement is high and the distance between receiving and transmitting coil should also be increased. So for this purpose, Magnetic Resonant Coupling technology is appropriate and suitable. Also, we conclude that the wireless charging method requires more time to charge a battery than the other types of charging methods. Our project only represents the prototype of Automation in the wireless charging of electric vehicle systems.

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Professional Chapter

IE (I) and ISTE:

Prof. V. P. Kuralkar- coordinator

Department of Electrical Engineering has professional chapters namely The **Institution of Engineers IE(I)** and **Indian society of technical education (ISTE)**, the headquarters of IE(I) is at Kolkata.

The aim of establishing these chapters is to conduct various technical as well extracurricular activities for students to develop the overall personality of the students apart from the academics. Financial help is also provided by these chapters to the students. These activities provide a platform for the personality development of the students and also help to bridge the gap between the academics and the industries.

1) Under these chapters' various technical activities such as paper presentation, project competition, model making, technical quiz etc are conducted. These activities enhance the technical skills as well as verbal and communication skillset of the students.
2) Workshops (PLC, Programing, electronics, microprocessor etc.) are also conducted for the students and are sponsored by the chapters. These workshops are conducted by highly proficient and skilled industrial experts.
3) Expert lectures, technical demonstrations, industrial visits, tutorials, special technical talk sessions, career guidance lectures, mock interviews, group discussions are also some of the activities organized under these chapters.

IEEE Students Chapter:

Dr. A. D. Shiralkar - coordinator

Institute of Electrical and Electronics Engineers (IEEE), is the world's largest professional association. It is dedicated to advancing technological innovation and excellence for the benefit of humanity. IEEE and its members inspire a global community through IEEE's highly cited publications, conferences, standards, professional and educational activities.

IEEE students Chapter, AISSMS IOIT was formed in the year 2014. It is dedicated to serving the purpose of helping its members to enrich their technical knowledge and expertise. Currently, 30 students are active members of the branch volunteering various activities and 160 students are members. The main focus of this branch is to conduct technical, social, and techno social activities such as webinars, expert lectures, workshops, hands on sessions, and competitions, etc. for students of all branches. It also creates awareness and encourages students to utilize the benefits of IEEE membership, including competitions, and international conference grants.

Department Activities

Power Quality cell

Prof. Sachin Shelar

POWER QUALITY (PQ) CELL ESTABLISHED IN 2017 AIMS TO PROVIDE HANDS-ON EXPERIENCE TO THE STUDENTS AND HELP VARIOUS INDUSTRIES FOR SOLVING THE PROBLEMS RELATED TO ELECTRICAL POWER QUALITY.

New Power Quality Analyser Purchased **Elspec Pure BB**

Consultancy offered

1,91,750/-

Inauguration of PQ Lab at the hands Shri. Uday Samant sir- Minister of Higher & Technical Education, Government of Maharashtra

D M Tagare Power Quality Experience Center Inauguration Glimpses (29/08/2021)

Power Quality Audit Glimpses

FEV India Ltd.,Talegaon

Indospace, Ranjangaon

Indospace, Chakan

FEV India Ltd., Talegaon

Indospace, Ranjangaon

Madhav Capacitors Pvt. Ltd.

Renewable energy club (REC)

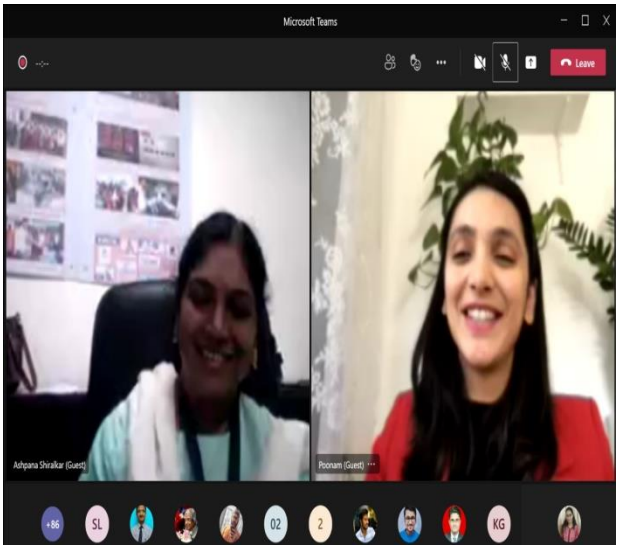
Prof. K. S. Gadgil - coordinator

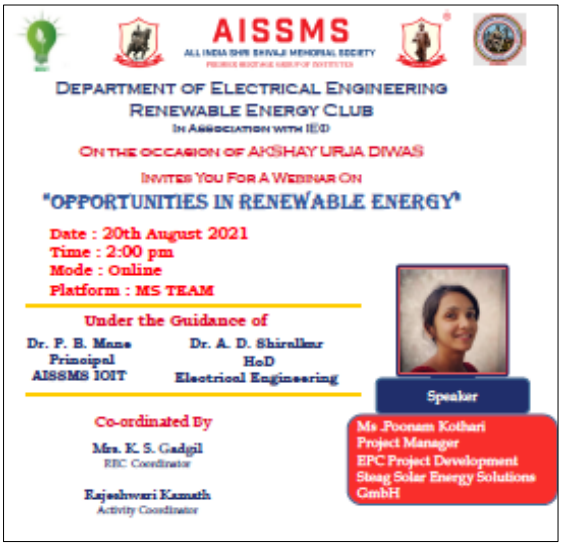
The department of electrical engineering established the **Renewable energy club (REC)** in 2007 under the guidance of the then HOD Mrs. M. H. Dhend. The club was initially funded by **MEDA (Maharashtra Energy Development Agency)** and MNRE (Ministry of New and Renewable energy sources).

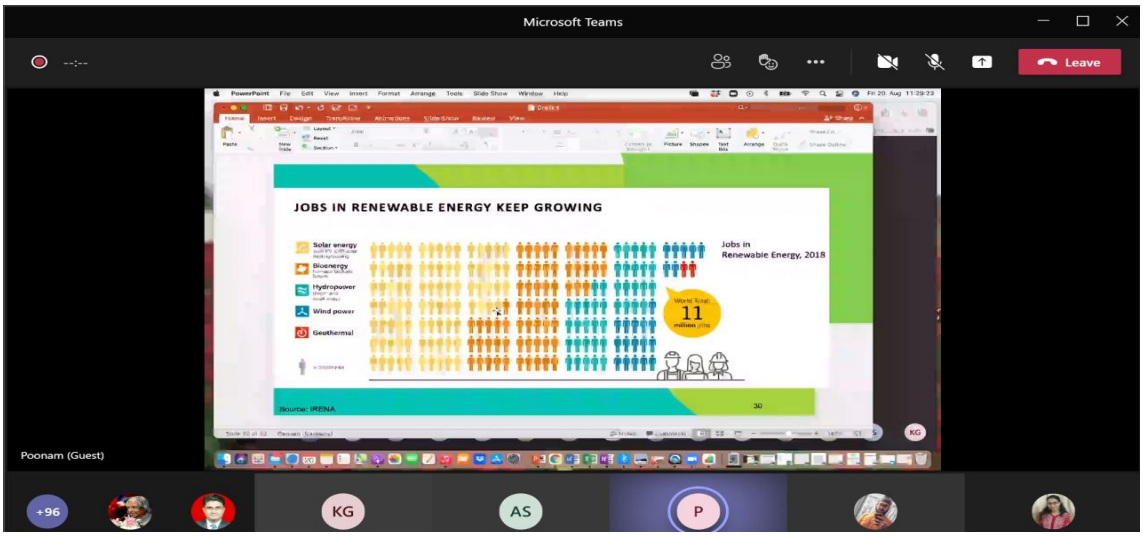
The club was established to enhance the knowledge of students about renewable energy sources and carry out various activities like energy conservation drives, poster competitions, quizzes, slogan competitions etc.

The students of the department carry out energy conservation drives and also celebrates Akshay Urja diwas on 20th August every year.

This A. Y. 2021-22 the Department had invited our Alumni Ms. Poonam Kothari who gave a seminar on “Opportunities in Renewable Energy”.







In addition, the department had organized a Poster Competition on occasion of “Engineers Day” 15thSept, 2022.

Electrical Engineering Students' Association (EESA)

Prof. S. N. Powniker - coordinator

EESA provides platform for the development of all rounded individual through co-curricular and extra-curricular activities and which positively impact students' emotional, intellectual, social, and inter-personal development. EESA not only renders forum for students to approach real world tasks but also develop innovative, socially responsible Engineers with High Human Values.

Selection Process

In Electrical Department SE, TE, BE students are members of Electrical Engineering Students' Association. Students nominate themselves for various post of the EESA committee. Under the guidance of Head of the Department, Senior Faculties & EESA coordinator, interview rounds are conducted for various posts of EESA committee to select committee members and further they execute Cultural, Technical & Sports activities throughout the academic year.

EESA Committee Role
General Secretory
Joint General Secretory
Treasurer
Technical Head
EESA Event Coordinator
Renewable Energy Club Coordinator
Sports Secretary
Executive Members Sports Section
T and P Coordinator
Study Circle Coordinator
Library In-charge Study Circle Coordinator
Cultural Event Coordinator

By working together with other individuals, students learn to negotiate, communicate, manage conflict, and lead others. Taking part in these out-of-the-classroom extracurricular and co-curricular activities helps students to understand the importance of critical thinking skills, time management, and academic and intellectual competence.

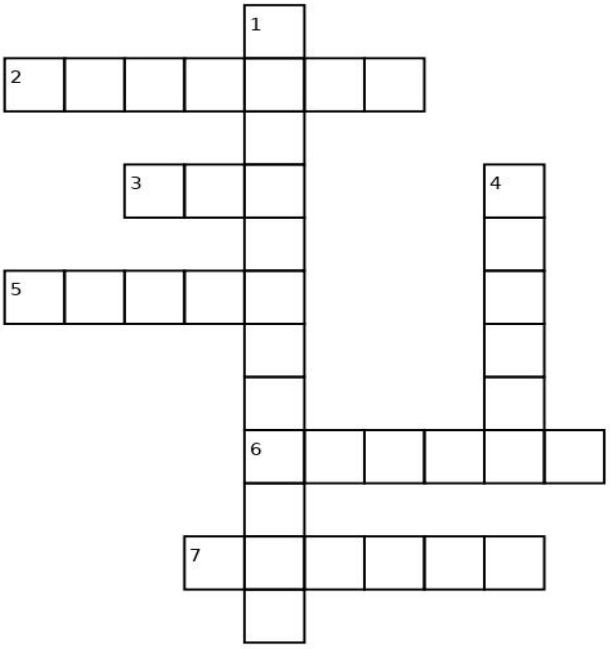
Each year EESA receives overwhelming response for social activities such as Tree Plantation, Social awareness drive, Food-clothing Donation campaign, Blood Donation Drive, Fort-Hill cleanliness drive.

Aurdino Workshop for SE Electrical Students organized by EESA on 16/12/2021

Puzzles and Quiz

Cross word Puzzle for High Voltage Engineering

Prof. S. M. Shaikh



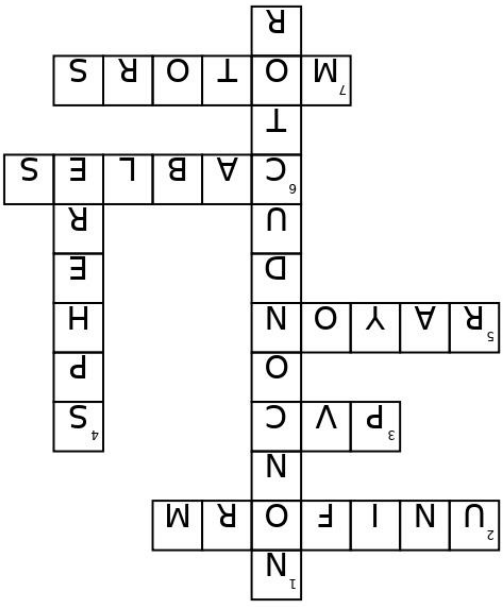
Down:

1. for operating power frequency voltages, a surge arrester has to be a _____
4. For voltage measurements, the gap which gives highest accuracy is _____

Across:

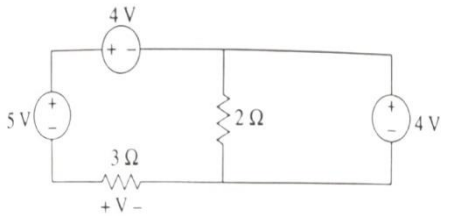
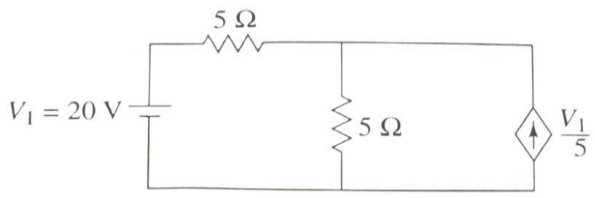
2. Field in case of sphere gaps is _____
3. The most commonly used insulating materials for low and medium voltage cables is_____
5. The example of artificial fibre is _____
6. Treeing phenomenon is observed in_____
7. Resins and varnishes are commonly used in_____

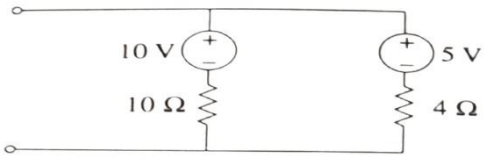
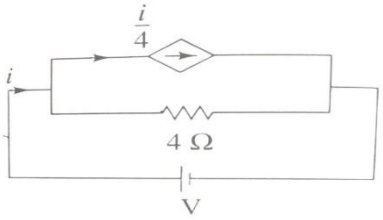
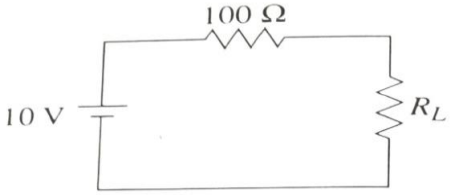
Answer:

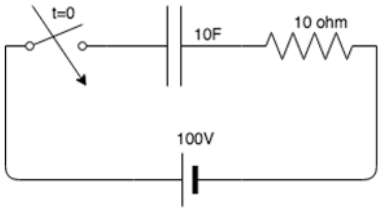
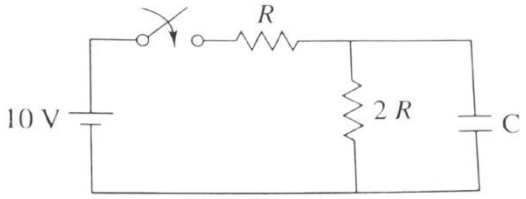


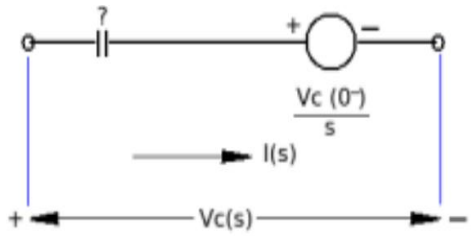
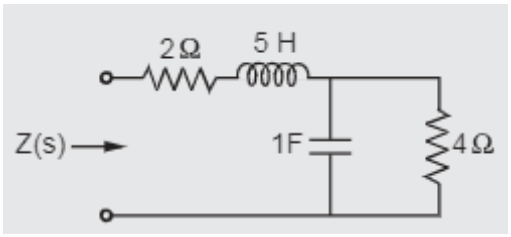
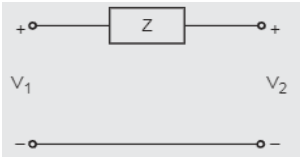
Technical Quiz ON Circuit Network

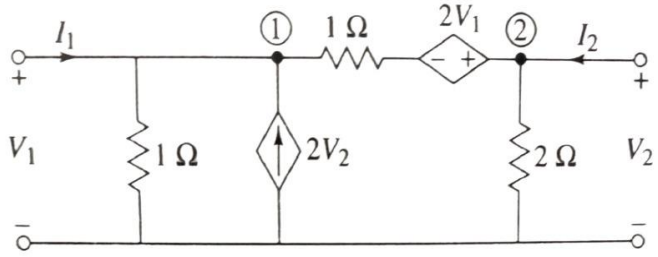
Prof. S. D. Raste

Que. No.	Question	Ans	Marks	Out of Marks
1	The Voltage V in given fig. is equal to 			1
	a. 3 V			
	b. -3 V			
	c. 5 V			
	d. none of these			
2	If the length of wire of resistance R is uniformly stretched to n times its original value, its new resistance is			1
	a. nR			
	b. R/n			
	c. n^2R			
	d. R/ n^2			
3	The circuit whose properties are same in either direction is known as			1
	a. Unilateral circuit			
	b. Bilateral circuit			
	c. Irreversible circuit			
	d. Reversible circuit			
4	The dependant current source shown in fig. 			2
	a. delivers 80W			
	b. absorbs 80W			
	c. delivers 40W			
	d. absorbs 40W			

5	A network contains only an independent current source and resistors. If the values of all resistors are doubled, the value of the node voltages will …….. a. become half b. remain unchanged c. become double d. none of these			1
6	viewed from the terminal AB, the following circuit can be reduced to an equivalent circuit of a single voltage source in series with a single resistor which of the following parameters.  a. 5 V source in series with a 10 ohm resistor b. 1 V source in series with a 2.4 ohm resistor c. 15 V source in series with a 2.4 ohm resistor d. 1 V source in series with a 10 ohm resistor			1
7	In the network shown in fig the effective resistance faced by the voltage source is  a. 4 ohm b. 3 ohm c. 2 ohm d. 1 ohm			1
8	The maximum power that can be transferred to the load resistance from the voltage source in given fig.  a. 1 W b. 10 W c. 0.25 W d. 0.5 W			2

9	the time constant of RL series circuit			1
	a. RL			
	b. R/L			
	c. L/R			
	d. L			
10	what will be the voltage across capacitor at t=0  			1
	a. 0 V			
	b. 10 V			
	c. 20 V			
	d. infinity			
11	The expression for the current in an RC circuit is?			1
	a. i =(V/R) e^t/RC			
	b. i = (V/R) e^-t/RC			
	c. i = (V/R) (1-e^t/RC)			
	d. i = (V/R)(1- e^-t/RC)			
12	The time constant of the network shown in fig.  			2
	a. 2RC			
	b. 3RC			
	c. (1/2)RC			
	d. (2/3) RC			

13	From the circuit diagram shown below, what would be the value of transform impedance of a single capacitor in Laplace domain?  	a		2
	a. 1/sC			
	b. sC			
	c. sC-1			
	d. sC/(1+sC)			
14	Find the driving point of impedance  	a		3
	a. (5 S^2+3.25s+1.5)/(s+0.25)			
	b. (5 S^2+3s+1.5)/(s+0.25)			
	C. (5 S^2+3s+1.5)/(s-0.25)			
	d. (5 S^2+3.25s+1.5)/(s-0.25)			
15	obtain transmission parameter of given circuit  	a		2
	a. A=1 B=Z C=0 D=1			
	a. A=-1 B=Z C=0 D=1			
	a. A=1 B=0 C=Z D=1			
	a. A=1 B=Z C=0 D=-1			

16	apply nodal analysis and Find Y parameters of the given Network 			3
	a. Y11=4 Y12= -3 Y21= -3 Y22=1.5			
	b. Y11= Y12= Y21= Y22=			
	c. Y11= Y12= Y21= Y22=			
	d. Y11= Y12= Y21= Y22=			
17	find the poles of I1(S)= 40(s+9)/s(s+2)(s+12)			2
	a. s = 9 rad/s			
	b. s = 0, 2,12 rad/s			
	c. s = 0, -2, -12 rad/s			
	d. s= -9 rad/s			
18	for Design T section Constant K-low pass filter having cut-off frequency of 2 KHz and R0= 600 ohm Determine L & C value.			3
	a. L=95.49 mH C=0.265 microF			
	b. L=95.49 mH C=0.1325 microF			
	c. L=47.74 mH C=0.1325 microF			
	d. L=47.74 mH C=0.265 microF			
				30

Answers

Que No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Ans	a	c	b	a	c	b	b	c	c	a	b	d	a	a	a	d	c	a

Technical Activities Glimps

GLIMPS OF THE ACTIVITIES

Prof. V. P. Kuralkar

<table>
<tr>
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<tr>
<td>Hands on experience during the workshop on Industrial Automation 24/03/2022</td>
<td>Interaction during the workshop Industrial Automation 24/03/2022</td>
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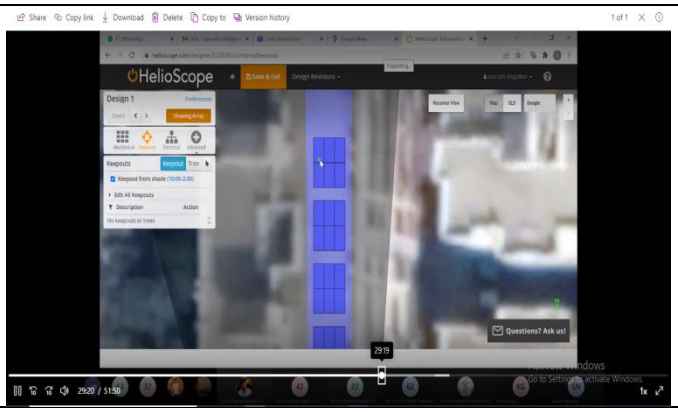
<td> 
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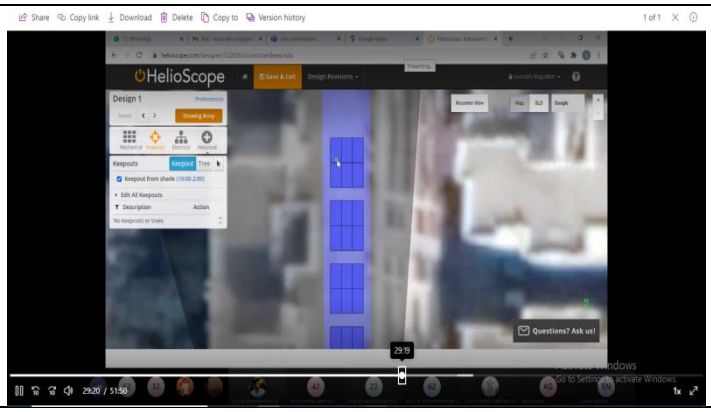
<td> 
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<td>Slides during the presentation in the webinar Opportunities in Solar PV 15/02/2022</td>
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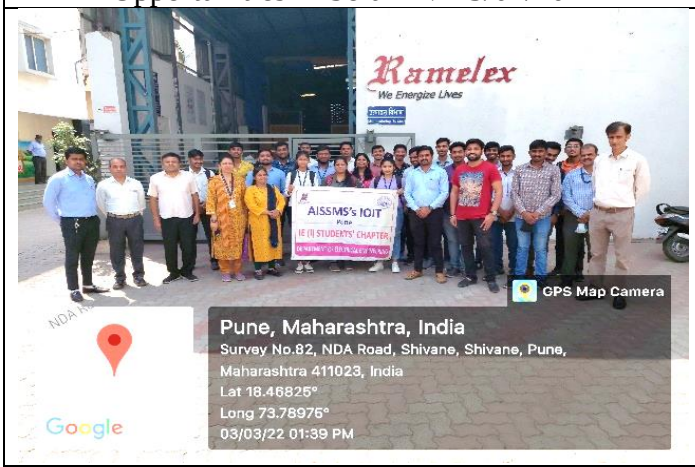
<td> 
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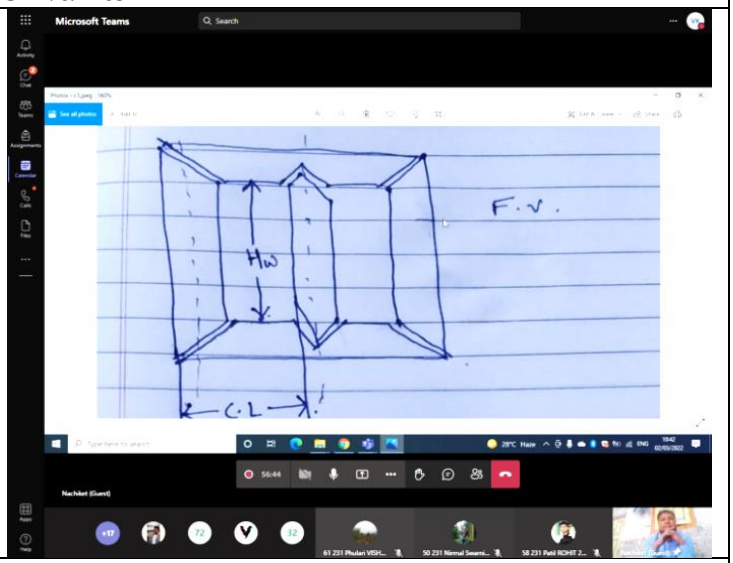
<td>Group photo clicked in front of the manufacturing plant during the Industrial visit to Ramelex Private Limited (RPL)</td>
<td>Few student and staff understanding the manufacturing process during the Industrial visit to Ramelex Private Limited (RPL)</td>
</tr>
</table>

Mr. Suneel Tiwari explaining about Planning & Success Tips to Crack ESE & GATE Exams , 08/03/2022

Mr. Suneel Tiwari explaining about Planning & Success Tips to Crack ESE & GATE Exams , 08/03/2022

Students understanding the Tank and core assembly of Transformer during the Industrial visit to Manisha Engineers Pvt. Ltd



Glimpses of the workshop Design and testing of three phase transformer 02/03/2022 to 04/03/2022

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YEAR : 2021-22

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