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Dr. Suman Joshi

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Inspiring Soul

The actual fact of life is,
"To achieve Golden path to success;
one must strive hard from dawn to dusk".
The crux behind this is,
"The hard work that you put in,
will be recognized as an appreciation by honor of success".

- Mukut Behari Lal

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The Editorial Board invites original, unpublished contributions in the form of Research Papers, Articles, Book, Reviews and Case Studies.

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From Chairman's Desk

Dear All,

It gives us a great pleasure that Rajshree Institute of Management and Technology is going to publish volume-5 of e-Journal of Indian Institute for Engineering, Management and Science (e-JIIEMS). Our institution appreciates the role of research in the education and inclination towards research. Research can lead to new innovations, discoveries for students and faculty members. For a wonderful success in research, you need not to know everything but you just need to know one thing that is not discovered.

I hope this issue of journal would inspire all of us the innovation as the key to the future and the research idea as the key to future innovations.

I wish you all a great success ahead.

Rajendra Kumar Agarwal
Chairman
Rajshree Group of Institutions
Bareilly

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Editor in Chief Message

Dear All,

We are honored to announce the publication of fifth volume of e-journal of Indian Institute for Engineering, Management and Science. This volume comprises the research papers based on today's fast growing technologies of Artificial Intelligence with their challenges, opportunities, applications in manufacturing, purchasing, supply and management and its impact on society. It also includes the maximum power point tracking devices and maximize output performance of Photovoltaic module.

I wish, all the innovative research could help to improve educational practices by providing insights for educators. The researcher would get benefitted from the research outcomes of these valuable contributory papers of this volume.

I wish a great success of the work of authors, reviewers and committee members for their contribution.

Dr. Suman Joshi
Associate Professor
Rajshree Institute of Management & Technology
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e-Journal of Indian Institute for Engineering, Management and Science (e- JllEMS)

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Artificial Intelligence: Challenges, Opportunities & Its Impact on Society Women Education

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Abstract:
Artificial intelligence (AI) refers to the development of intelligent computer systems capable of doing tasks that would ordinarily require human intelligence, such as visual perception, natural language processing, decision-making, and speech recognition. This discipline is rapidly increasing. AI has several applications, including banking, education, healthcare, and transportation. AI has the potential to empower women and improve gender equality by providing innovative solutions to specific problems they face.

1. Introduction

Artificial intelligence is a rapidly developing technology that has the potential to transform all aspects of our social interactions. AI has begun to develop novel teaching and learning solutions, which are currently being tested in a variety of scenarios. In many civilizations, artificial intelligence (AI) has played a significant role in empowering women and promoting gender equality. The purpose of this study is to understand and highlight the challenges, opportunities and impact of AI on women education. In accordance with the objectives of the present study secondary data Thesis, research papers, articles, journals, sites, etc. were studied. The objective of this study is to comprehensively explore the challenges, opportunities, and overall impact of artificial intelligence (AI) on women's education. To gain a thorough understanding of how AI influences various aspects of women's education.

Women are crucial to a nation's progress. Education and empowerment aim to elevate women's status across political, social, economic and cultural spheres. The phrase "empowering women" refers to a variety of programmes aimed at raising the status of women in society, the economy, and politics (Al-shami et al., 2018; Hameed et al., 2020; Stollak et al., 2023). More and more individuals realize that technology, particularly artificial intelligence (AI), can considerably aid the movement to empower women. This essay examines the complex relationship between artificial intelligence and women's empowerment, citing instances of women's access to financial resources, educational chances, and entrepreneurial inventiveness. Wealth, education, and employment disparities between men and women continue to exist around the world. To seek to decrease these inequities, we must consider social fairness as well as economic growth and development. In this context, AI has emerged as a game-changing force (Chen et al., 2020; Rodgers et al., 2023), with the potential to reshape the landscape of gender equality by assisting in the resolution of some of the long-standing issues that women worldwide face.AI, which is the development of computer systems capable of learning, reasoning, problem solving, and decision making, is the key independent variable in this study (Iandolo et al., 2020; Pavlik, 2023). AI technologies have numerous applications, ranging from machine learning algorithms to NLP and robots. It is impossible to overstate the importance of these technologies in empowering women and transforming businesses. Financial inclusion is the major dependent variable being considered in this scenario. Banking, savings, credit, insurance, and electronic payment systems all contribute considerably to women's financial inclusion. Accessing traditional banking institutions can be a challenge for women frequently. However, the rise of artificial intelligence-powered financial technology, also known as Fin Tech, has the potential to expand financial services to remote and underserved places (Gladden, 2020; Khan et al., 2021). Credit scoring methods based on artificial intelligence (AI) can help to reduce credit disparities across genders while also promoting inclusivity and asset accumulation.

Additionally, schooling and education is used as the dependent variable in this study. Education has a critical role in promoting and achieving gender equality. The promise of AI to improve educational outcomes is clear in its variety and adaptability, as proven by personalized learning systems, online courses, and AI tutors. Education, due to its inherent versatility, has become available to women of all ages and socioeconomic backgrounds. Artificial intelligence (AI) can help create educational curriculum that especially target and lessen gender preconceptions and prejudices, claim Iandolo et al. (2020). This use of artificial intelligence (AI) can help to create a more inclusive learning environment in the classroom. As noted by Klockner et al. (2020) and Pekovic & Rolland (2016), company innovation is an important issue to consider. Opportunities for entrepreneurship considerably benefit women's economic independence. AI-powered technology has the ability to improve corporate processes, inspire innovative product development, and open up new market opportunities. Women company entrepreneurs may leverage AI-powered analytics and automation to make data-driven decisions, improve supply chains, and enter new markets. Furthermore, AI can assist identify market gaps and consumer preferences, allowing women-owned businesses to offer unique solutions that fit the needs of a diverse spectrum of clients. In summary, the purpose of this study is to look into the long-term effects of AI on women's advancement, with access to economic resources, higher education, and new commercial prospects serving as major outcome measures. We can leverage technology's full potential to advance gender equality and create a more inclusive and equitable society if we have a better understanding of how AI can help women's communities and address the challenges and possibilities it presents.

1. Methodology

The purpose of this study is to comprehensively explore the challenges, opportunities, and overall impact of artificial intelligence (AI) on women's education. The study aims to gain a thorough understanding of how AI influences various aspects of women's education, including access to educational resources, learning outcomes, teaching methodologies, and educational equity.

To achieve this goal, the researcher utilized secondary data sources such as thesis, research papers, articles, journals, websites, and other relevant materials. By examining existing literature and empirical studies in this field, the researchers sought to gather insights, analyze trends, and identify key findings related to the intersection of AI and women's education. Through a systematic review and analysis of secondary data, the study aims to uncover the challenges that women face in accessing quality education, as well as the opportunities presented by AI technologies to address these challenges. Additionally, the researchers aim to examine the broader impact of AI on women's education, including its potential to enhance learning outcomes, promote educational equity, and empower women through education. Overall, by synthesizing existing knowledge and insights from diverse sources, the study aims to contribute to a deeper understanding of the role of AI in shaping the landscape of women's education, with a focus on both the challenges and opportunities it presents.

AI bias and Gender Gaps: AI bias occurs when machine learning algorithms reflect biases from their training data, disproportionately affecting certain groups like women. This bias can reinforce stereotypes, exclude women from decision-making, and perpetuate discrimination. Examples include voice assistants defaulting to female voices and biased hiring algorithms favoring men. The gender gap in AI, with women underrepresented in AI professions and development teams, hinders fair and inclusive AI. Efforts to promote gender inclusivity in recruitment, leadership, and education, along with implementing inclusive policies, are crucial to address this issue.

How AI Influences Various Aspects of Women's Education: Several studies have explored the impact of Artificial Intelligence (AI) on women's education, shedding light on various aspects of this intersection. Here are some relevant studies:

(i) The Role of AI in Improving Access to Education for Women in Developing

Countries": This study examines how AI technologies can be leveraged to overcome barriers to education faced by women in developing countries. It explores the potential of AI-driven platforms and tools to provide personalized learning experiences and enhance educational access for women and girls in underserved communities.

(ii) "Addressing Gender Bias in AI Educational Tools": This research focuses on identifying and mitigating gender bias in AI algorithms used in educational settings. It investigates the impact of biased algorithms on women's learning outcomes and explores strategies to develop AI- driven educational tools that promote gender equity and inclusivity.

(iii) "Empowering Women Through AI-Driven Education": This study explores the potential of AI-powered educational interventions to empower women and girls by providing personalized learning experiences and fostering digital literacy skills. It examines how AI can support self-directed learning and enhance educational opportunities for women across different age groups and socio-economic backgrounds.

(iv) "AI and Gender Equity in STEM Education": This research investigates the role of AI in promoting gender equity in Science, Technology, Engineering, and Mathematics (STEM) education. It explores AI-driven initiatives aimed at engaging girls in STEM fields and examines the impact of these programs on closing the gender gap in STEM-related careers.

(v) "Ethical Considerations in AI-Enabled Education for Women": This study explores the ethical and social implications of integrating AI into women's education. It examines issues related to privacy, data security, and algorithmic transparency and develops ethical frameworks and guidelines to ensure responsible AI use in educational settings.

(vi) "Policy Approaches to Promoting Gender-Inclusive AI Education Initiatives": This research focuses on policy approaches and advocacy efforts aimed at promoting gender-inclusive AI education initiatives. It examines the role of government policies, funding initiatives, and public-private partnerships in advancing women's education through AI-driven interventions.

(vii) (vii)These studies provide valuable insights into the opportunities and challenges associated with the integration of AI into women's education, offering recommendations for policymakers, educators, and technology developers to ensure gender equity and inclusivity in AI-enabled educational environments.

2. The Challenges, Opportunities & Overall Impact of Artificial Intelligence (AI) on Women's Education :

The challenges, opportunities, and impact of AI on women's education are multifaceted and dynamic, encompassing various aspects of access, quality, equity, and empowerment. Here's a breakdown of each: Challenges:

Access Disparities: Women in specific locations or socioeconomic backgrounds may encounter challenges to accessing AI-powered educational resources owing to lack of infrastructure, connectivity, or digital literacy.

Gender Bias in AI Algorithms: AI systems used for education run the risk of propagating gender bias, which can lead to unequal learning opportunities or the reinforcement of stereotypes.

Skill Gap: Women may face difficulties in learning the skills required to effectively use AI technology for educational purposes, particularly in subjects such as computer science and data science.

Privacy and Security issues: The integration of AI into educational platforms raises issues about data privacy and security, particularly the acquisition and use of personal information.

Opportunities:

Customized Learning: AI-powered adaptive learning platforms can tailor to individual learning styles and preferences, making education more successful for women with various requirements.

Bridging the Education Gap*:* AI-powered products like online courses and virtual coaching can help women in distant or underprivileged areas gain access to quality education.

Skill Development**:** AI-based educational programmes can help women build skills in emerging technologies, preparing them for future job prospects.

Innovation in Teaching Methods: AI offers novel teaching approaches such as gamification and interactive simulations, which can improve female learners' engagement and retention.

Impact:

Improved Learning Outcomes: AI can provide personalized help, feedback, and adaptive learning routes for women learners.

Empowerment through Education: Access to AI-powered educational resources can provide women with information, skills, and confidence, allowing them to pursue higher education, professional progression, and leadership positions.

Closing the Gender Gap in STEM: By offering inclusive and engaging learning experiences, AI can help recruit more women to STEM (science, technology, engineering, and mathematics) careers.

Socioeconomic Empowerment: By providing women with AI skills and knowledge, there is a possibility to improve socioeconomic status, encourage entrepreneurship, and promote economic independence in communities. Overall, while there are obstacles to overcome, the prospects and beneficial effects of AI on women's education are significant, with the ability to promote genuine change and empowerment across societies.

Conclusion: “There is no greater *pillar of stability* than a *strong, free & educated woman*.” The utilization of AI to enhance women's access to economic opportunities holds significant potential for widespread impact. AI can serve as a crucial tool in dismantling barriers that have historically hindered women's participation in the formal financial system. It achieves this by broadening access to financial services, improving decision-making through data-driven insights, equipping women with financial literacy resources, and advocating for gender-responsive policies. However, for AI to fully realize its potential in driving financial inclusion and gender equality, it is imperative to address challenges related to data bias, accessibility, privacy, and digital literacy. As AI technologies continue to advance, their role in facilitating women's economic engagement will become increasingly significant. Moreover, AI stands to make substantial contributions to narrowing gender gaps in education. By enhancing access, personalizing learning experiences, improving educational quality, and fostering empowerment, AI can play a pivotal role in this regard. Overcoming obstacles such as technology access, data privacy concerns, teacher training, and socio-cultural barriers is essential to ensure that AI becomes a catalyst for women's education worldwide. The importance of AI technology in advancing gender parity through education is poised to grow, driving transformative change and granting women greater agency globally. Furthermore, AI represents a critical element in driving commercial innovation in the contemporary digital landscape. Given its potential to enhance operational efficiency, foster innovation, create new business models, and more, AI has become indispensable in the corporate world. Organizations that invest in AI-driven innovation gain a competitive edge and can capitalize on emerging market opportunities. address challenges related to data management, ethical considerations, skills development, and integration. Ultimately, AI has the capacity to revolutionize entire industries, fuel economic growth, and reshape the operational land scape for successful enterprises today.

Suggestions: Some suggestions for exploring the intersection of artificial intelligence (AI) with women's education:

***Closing Gender Gaps in Education*: I**nvestigate how AI technologies can help bridge the gender gap in education by providing tailored learning experiences that cater to the needs and preferences of female learners. Explore initiatives and case studies where AI has been successfully used to improve educational outcomes for girls and women.

Enhancing Access to Education : Examine how AI-powered platforms and tools can increase access to education for women in underserved communities, remote areas, and developing countries. Discuss the role of AI in delivering educational content through online platforms, mobile applications, and virtual classrooms.

***Personalized Learning for Women*:** Explore the potential of AI algorithms to personalize learning experiences based on individual learning styles, interests, and abilities. Investigate how adaptive learning technologies can support women in acquiring new skills, pursuing higher education, and advancing their careers.

***Empowering Female Educators*:** Discuss the impact of AI on empowering female educators through professional development opportunities, resource-sharing platforms, and collaboration tools. Highlight the role of AI in supporting teacher training programs and enhancing the effectiveness of pedagogical practices.

***Addressing Barriers to Education*:** Analyze how AI solutions can address common barriers to women's education, such as lack of access to quality education, cultural norms, socio-economic disparities, and gender-based discrimination. Explore innovative approaches to overcoming these challenges using AI-driven interventions.

***Promoting STEM Education for Girls*:** Explore initiatives aimed at encouraging girls to pursue STEM (Science, Technology, Engineering, and Mathematics) education and careers through AI-enabled educational programs, mentorship networks, and experiential learning opportunities. Discuss the potential of AI to inspire and empower girls to engage in STEM fields traditionally dominated by men.

***Ethical and Societal Implications*:** Consider the ethical considerations and societal implications of integrating AI into women's education, including issues related to data privacy, algorithmic bias, digital divide, and the impact on socio-cultural norms. Discuss strategies for ensuring equitable access to AI-driven educational resources and mitigating potential risks and biases.

By examining these aspects, you can provide a comprehensive analysis of how AI presents both challenges and opportunities for advancing women's education and its broader implications for society.

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Module-Level Direct Coupling in PV- Battery Power Unit under Realistic Irradiance and Load

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Abstract:
a photovoltaic (pv) module, battery, and consumer or load are generally tied together by complex power electronics, including a maximum power point tracking (mppt)device for power coupling to maximize the output of the pv modules. at the same time, a typical battery itself can play the role of a power coupling element in adding to its foremost energy-storing function. in principle, an exactly selected pv-battery pair can maintain a high degree of internal power coupling even under variable irradiance and load without mppt electronics. for example, managing the inherent intermittency of a pv module's power production requires module-level integration of pv and battery. in this study, we investigate the operation of a lab-scale, 7-cell silicon hetero junction photovoltaic module that is directly connected to a lithium-ion battery and a changing load through experimentation. The unit is the most basic pv-battery module representative for in-depth analysis under a number of matched, realistic profiles of power consumption and irradiance. In comparison to contemporary mppt devices, the directly coupled pv-battery unit shows coupling efficiencies of above 99.8% at high irradiance and about 98% on average during the daily cycle.

1. Introduction

In the future, photo voltaics (PV) may prove to be a significant energy source [1]. The same research states that photo voltaics (PV) can account for up to 69% of all energy generated. PV needs a lot of storage to stabilize the power supply because it is an intermittent technology. The timing mismatch between the peaks of PV output and power use, also known as the "duck curve" problem, still presents a challenge to the implementation of PV [2]. A simple solution to the issue of the inherent temporal mismatch between PV generation and power Consumption is the use of electro chemical batteries as energy buffer storage [3]. Pv and battery technology integration at pv battery and photovoltaic integration at the pv module level is a less-tried, difficult, but possibly useful approach. Pv modules with adequate internal energy buffers will produce electricity much more smoothly, with broad generating peaks, gentle power ramps, and longer power output in the evening and at night. Reducing the peak power rating of pv system components is possible with smoother, more consistent module output, potentially lowering the system's cost without sacrificing dependability. Extended energy generating hours naturally solve or lessen the "duck curve" problem. Finally, it has been demonstrated that the stability and efficiency of electro chemical solar fuel generation, such as water splitting, are improved when PV and batteries are combined [5]. In other words, Put differently, power coupling describes the device's capacity to use the PV module's maximum available power. This is especially important because PV-battery modules, which are a common aspect of PV systems, may be internally matched without the need for maximum power point trackers (MPPT). When designing PV systems, an MPPT device offers a high degree of design freedom and consistent PV module output under sporadic irradiation [6]. None the less, the amount of power electronics used in the system can be decreased if the battery can deliver a level of power coupling that is equivalent. All things considered, the idea of a module-level integrated PV battery device has great potential for more straight forward, affordable, and dependable PV systems with extremely consistent power production. PV-battery integration at the module level is likely in the near future, despite a number of problems with battery performance at high temperatures, long evity, and cost still need ingtobere solved before dependable and reasonably priced PV-battery modules can be realized. Nevertheless, battery technology is advancing quickly. Mean while, numerous new PV technologies, such as water-based dye sensitized solar cells or sustainable Perovskite solar cells, and con current advancement sin crystalline silicon technology, such as silicon hetero junction solar cells, are opening up new possibilities for PV-battery integration at various scales and levels for indoor and outdoor applications. This work uses replicated realistic profiles of irradiance and power off take to evaluate experimentally the predictions of high efficiency and operation stability in voltage-matched PV-battery systems. The study focuses on losses in PV-battery combinations as well as stability and internal power conversion efficiency. In this experiment, we investigate a basic PV-battery combination consisting of a single-cell commercial Li-ion battery directly linked to a Silicon Hetero junction (SHJ) solar cell micro module [8]. Generally speaking, battery cells have voltages higher than solar cells. To match the voltage range of the battery, a number of solar cells must be linked in series or stacked in tandem to form a module. The voltage range in which commercial Li-ion batteries normally function is between 3.7 and 4.3V or about equivalent to the maximum power point voltage of seven SHJ cells connected in series. Using a load profile and global horizontal irradiance pattern characteristic of Nigerian urban areas, the cycling is achieved in a lab experiment. In this study, "module-level direct coupling "refers to connecting a PV module directly to a battery without the need for power electronics. The paper illustrates that in practical operation, a directly connected PV-battery-load unit may have considerable losses al legedly because of inadequate internal power coupling. We concentrate on coupling efficiency or coupling factor in the PV-battery module in this work because of the significance of the power coupling issue. The MPPT performance data. When tracking MPP, MPPT machines typically exhibit exceptional performance, with "tracking efficiency" or "MPPT efficiency" reaching up to 99.8%. But it's important to distinguish between tracking efficiency and energy efficiency, which often peaks between 93% and 96% because to MPPT electronics self-consumption [10]. The key performance metric of the PV-battery unit is the coupling factor *C* defined as the ratio between the output power of thePV (P_{PV}) at the actual module working point (WP) and maximum power point power (P_{MPP}) expressed as $C = P_{PV}/P_{MPP}$. Thus, a directly connected unit's utilization of the power available at MPP is described by the coupling factor. The directly coupled module's coupling factor C is compared to existing literature at a on MPPT power efficiency because it lacks any power-consuming electronics between the PV, battery, and load. The direct connected module level PV-battery unit exhibits a high potential according to the experiment's results, as it consistently performs well across a realistic operating cycle[11].

2. Experiment:

Measurement circuit: The circuit schematic in Figure 1 (a) illustrates a PV battery unit that is directly coupled and connected to a variable load resistor. This basic circuit is also what we used to build up our experiment in the lab, as Figure1(b) illustrates. The PV battery unit provides direct current (DC) to the load. With the least amount of voltage dips caused by measurement equipment, stable and repeatable current and voltage measurements between the system's components were achieved using an in-house constructed connection board. Additional Figure1 illustrates the board and connections for the parts. Take note that the circuit is devoid of any energy management systems or power management components. In this case, we deal with the most basic PV and battery setup. This reduces the power loss that comes with using the traditional method of connecting digital ammeters in series with the circuit to measure PV and battery current properly. The10 mΩ resistors' voltage is measured using Keithley digital multimeters (DMM). A Keithley SMM3706 A device records the battery voltage, while a Keithley SMU 2420device records the PV voltage. This method yields current and voltage data with appropriate accuracy for our analysis 0.11mA and 0.01V, respectively. The PV module is installed on the water-cooled stage of the W a com AM1.5G class-A sun simulator, which provides irradiance for the module at a temperature of about 25 ◦C. We refer to the configuration in the manuscript as the "PV- battery-load unit " because the PV-battery and load are constantly connected. PV module, battery and load seven silicon hetero-junction (SHJ) cells were used to create the laboratory-scale solar module, which was assembled on-site. As stated in (Leeetal.,2020), the SHJ cells were laser cut and joined using low-temperatures oldering in ashingled arrangement after being produced in accordance with (Duan et.al., 2022).

The area of each PV module cell is 3.2 cm 2, and the 7-cell module's total active area is 22.4 cm2. Figure 2 shows the current-voltage (IV) characteristics of the module tested under varying irradiance, ranging from1sun to 0.019 suns. Circles filled with yellow are used to represent the MPP's trail at various intensities. The module's efficiency is 19.2% and its open circuit voltage (Voc) is 5.03V under standard test conditions (STC). A commercially available lithium-ion cell, model number 153040 DNK, with a nominal capacity of 110 mAh and a nominal voltage of 3.7 V serves as the representation of the storage battery. The battery's chemistry is defined by the lithium- polymer (LIP) rechargeable cell. In order to research the features of the power module IV. The battery is depleted to its minimum rated cut-off voltage of 3.0 V in order to reach a minimal state of charge for the battery. Columbic counting, or charging under ones un and integrating the charging current with time, yields the maximum SOC. Expression that SOC[%]100×*Idt*/110.

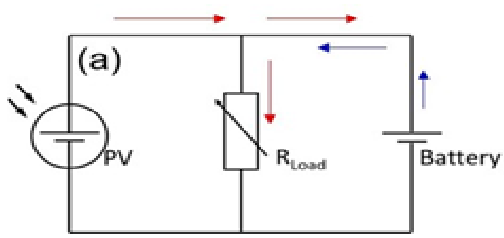

Figure 1. (a) Circuit diagram of a directly coupled PV-Battery- Load unit; PV connected directly to load and battery without a maximum power point tracking device. Red arrows indicate PV current and blue arrows indicate battery current.

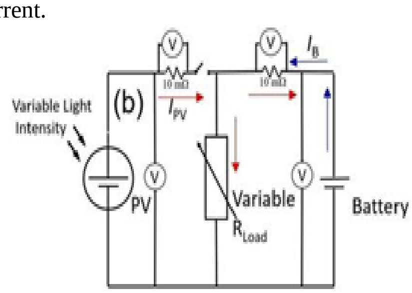

Figure 1(b) Circuit diagram of experimental set up showing digital voltmeters across sense resistors for measuring PV current (*I*PV) and battery current (*I*B), as well as devices for measuring voltage of the PV module and battery.

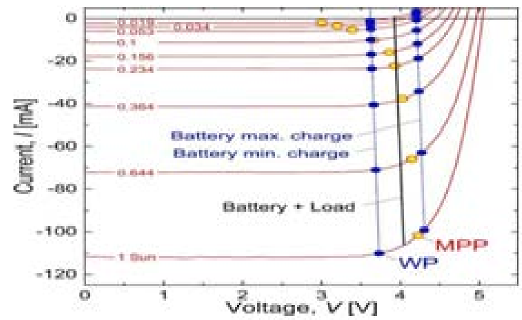

Figure 2 Current-voltage (IV) characteristics of the silicon hetero junction module.

As shown in Figure 2, the silicon hetero junction module's current-voltage (IV) characteristics measured under various irradiances are indicated for each IV characteristic (Redlines). The PV module's maximum power point (MPP) is shown by yellow-filled circles. Battery IV properties at the minimum and maximum charge levels (blue lines). The intersections of the IV characteristics at the PV and battery IVs that are indicated by blue closed circles are potential working points(WP) for the PV-battery combination. For a load resistance of 14.8 mW per cm2 (or 77%of PV1 sun capacity) and a battery SOC of around 75%, the black line depicts the common battery + load IV. (To make sense of the allusions to color in this figure legend, the However, in order to determine the range in which the operating point of the PV-battery combination can be situated in relation to the PV module's maximum power point, it seems sense to assess battery IV properties under various battery charge levels. This is crucial for power connecting a battery to a specific photovoltaic module. When connecting the battery to the module, a considerable amount of power will be lost at the MPP if the battery's IV region at lower stand maximum SOC is far enough away from the module's MPP at various irradiance levels. Figure 2 displays the battery IV characteristics obtained at both minimum and maximum SOCs (min and max charge). The maximum SOC is achieved by charging under 1 sun and integrating the charging current with time (i.e. columbic counting) using the expression that SOC[%] = 100×$\int$*Idt*)/110. Thechargedcapacity$\int$ *Idt*) in mAh is divided by the nominal full capacity of 110mA hand multiplied by 100 to get the SOC in %. supplementary Figure S2 displays the charging and discharge voltage versus SOC p lot for1 Crate and displays the battery's working voltage window of 3.0–4.54 V. According to Figure 2, the battery IV characteristics have as lope of—1.03A/V at the minimum and—1.02 A/V at the highest SOC. It is note worthy that despite these extremes of SOC, the slope of the battery IV plots stayed relatively unchanged. Overall, the study's cell like many other contemporary commercial battery cells, displays extremely stable linear IV switch a constants lopes within the application conditions' normal range (state of charge and currents). Potential battery charge leakage through the forward biased PV module in the direct coupling is one of the adverse effects. Dark current (Id) is the term used to describe the recorded backflow of current in the simplest case of a directly coupled unit at very low illumination and ultimately in the dark. By utilizing a blocking diode, this dark current loss can be eliminated. A manually regulated 10-to1000-ohm variable resistor and Bourns 3680 Precision Potentiometer was used to simulate the load's effect. We approximated power consumption within the range of 0.54 mW to 14.8 mW per cm2 of photo voltaic module, with the higher power corresponding to 77% of the PV capability under typical test conditions (1sun,AM 1.5). In Fig.2, the black line represents the common battery and load IV characteristic .At75% SOC, this typical battery-load IV characteristic is measured. Irradiance and power consumption profiles. The relevance of the study for field PV applications is based on the realistic irradiance and power usage profiles. The blue curve in Fig. 3(a) shows the global horizontal irradiance profile (Zubair et al., 2018) used as a reference to the laboratory experiment. This shows the variation of solar irradiance through out a typical day time for a hot climate region, having peaks of solar irradiance between12 and 2 pm in the afternoon. For a simple case of realistic profiles, we do not consider shading, clouds, rain or other adverse weather effects on the solar irradiance. The reference load consumption pattern for Nigeria urbanareaisal so shown (Adeoyeand Spataru, 2019). Both profiles have been reproduced in the laboratory experiment with stepped profiles.

3. Results:

Characterization of the unit: Effect of irradiance, battery state of charge and load on coupling factor

Discussion:

For illuminations over 0.1 sun and for all battery SOCs, extremely strong coupling factor C (above 0.9) is observed in the results of the experiments with isolated effects of irradiance and load power (refer to Figure 3). The coupling factor often lowers at low solar irradiance and like wise drops at high battery SOC (around 100%), indicating that low / intermediate battery SOC is the optimal SOC for maximizing power harvesting from the PV in the device under study. This is because, in our PV-battery combination, at maximum battery SOC, the PV module operating point moves progressively away from MPP, particularly at reduced solar irradiation.

4.

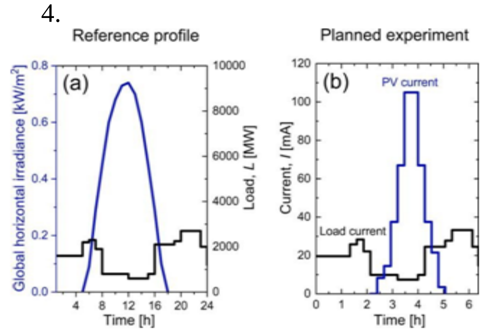

Figure 3 Reference profiles of global horizontal irradiance and load vs Priorto exposing the Unit to realistic profiles of irradiance and load and periodic cycling over the realistic profiles, the dependence of coupling factor on solar irradiance, battery SOC and load power was characterized separately.

The load does not have any significant impact on the coupling factor when a battery is present, at least in situations where the daily cycle's energy generation and load energy consumption are roughly equal. As a result, the battery functions as an effective coupling element under various load circumstances. As a consequence of the unit's very strong coupling in themostrelevant range of power-generating conditions in the cycling experiment depicted in Fig.3, the experiment ends with accumulative coupling efficiency of 98.23%. With an MPP power efficiency of 93-56%, this result is good and comparable to the top MPP systems found in literature.

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A Mini Review on Structure, Importance and Versatile Biological Applications of Schiff Bases

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Abstract
Schiff bases are useful organic compounds, gaining standing day by day due to their extensive applications. Schiff bases, comprising imines or azomethine functional groups, are synthesized by condensation of primary amines with carbonyl compounds or they may arise naturally in plants. They have lots of importance in industry and show abundant biological activities including antibacterial, antifungal, antiviral, anticancer, etc. The wide range of biological studies of the Schiff bases are now fascinating the attention of researchers which can lead to the identification of promising lead compounds. This review consists of the recent developments and various methodologies to synthesize Schiff base as well as their biological activities . Schiff bases are aldehyde- or ketone-like compounds in which the carbonyl group is replaced by an imine or azomethine group. An overview of synthetic methodologies used for the preparation of Schiff bases is also described.

Introduction

Schiff bases, named after Hugo Schiff [1], are designed when any primary amine reacts with an aldehyde or a ketone under definite conditions. Structurally, a Schiff base (also known as imine or azomethine) is a nitrogen equivalent of an aldehyde or ketone in which the carbonyl group (C,O) has been substituted by an imine or azomethine group. Among the most often utilized organic compounds are Schiff bases. They function as catalysts, polymer stabilizers, intermediates in organic synthesis, pigments, and dyes [2]. Additionally, various biological actions of Schiff bases have been demonstrated, such as antifungal, antibacterial, antimalarial, antiproliferative, anti-inflammatory, and antiviral properties. qualities that reduce fever [2,3]. Various natural, naturally produced, and non-natural chemicals contain imine or azomethine groups (see Fig. 2 for several examples). It has been demonstrated that these chemicals' imine groups are essential to their biological functions [4-6]. We outline the general methods for synthesizing Schiff bases in this review. Additionally, we highlight the most noteworthy instances of this family of compounds that have been documented in the literature as having antiviral, antibacterial, antifungal, and/or antimalarial properties. The connection between Schiff bases and additional pharmacological actions, including activities that are considered antiproliferative are excluded from this review. SBs were reported to exhibit antifungal activity against fungal strains including As per gillus fumigatus, Aspergillus flavus, Aspergillus niger, Candida albicans, Candida tropicalis, Candida guilliermondii, Candida glabrata, Cryptococcus neoformans, Epidermophyton floccosum, Histoplasma capsulatum, Microsporum audouinii, Microsporum gypseum, Penicillium marneffei, Trichophyton mentagrophytes, and Trichophyton rubrum, etc

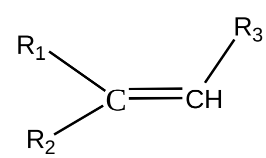


Figure 1- General structure of Schiff base

1. Synthesis of Schiff bases

Schiff (1864) documented the first imine production in the 19th century. Numerous techniques for synthesizing imines have been reported since then [7]. In the traditional synthesis described by Schiff, an amine and a carbonyl molecule are condensed using azeotropic distillation [8]. After that, water is eliminated using molecular sieves. generated inside the system [9]. Tetramethyl orthosilicate or tri methyl ortho formate, two dehydrating solvents, were used in the development of an in situ water elimination technique in the 1990s [10,11]. The effectiveness of these techniques is reliant on the employment of strongly nucleophilic amines and highly electrophilic carbonyl compounds, as Chakraborti et al. [12] showed in 2004. As an alternative, they suggested using compounds that operate as Lewis or Bronsted-Lowry acids to catalyze the nucleophilic attack by amines, activate the carbonyl group of aldehydes, and dehydrate the system until water is removed [12]. The production of Schiff bases involves the use of Lewis or Bronsted-Lowry acids, such as $ZnCl_2$, TiCl4, MgSO4-PPTS, $Ti(OR)_4$, alumina, $H2SO_4$, $NaHCO_3$, MgSO4, $Mg(ClO4)_2$, H3CCOOH, $Er(OTf)_3$, P2O5/Al2O3, and HCl [12–24]. A multitude of advancements and novel approaches have been documented in the last twelve months, encompassing solvent-free/clay/microwave irradiation, solid-state synthesis, K-10/microwave, water suspension medium,[bmim]vBF4/molecular sieves, infrared irradiation/no solvent, NaHSO4ÆSiO2/microwave/solvent-free, solvent-free/CaO/microwave, and silica/ultrasound irradiation [25–33]. Microwave irradiation is one of these technologies that has been widely used because of its remarkable selectivity, improved reaction speeds, and ease of operation [32]. The application ofthe separate studies of the Rousell and Majetich groups, microwave irradiation got underway [34, 35]. Since microwave irradiation eliminates the need for the Dean-Stark apparatus and the overuse of aromatic solvents for the azeotropic removal of water, it poses less of an environmental risk than other techniques. This approach also has the advantage of achieving high-efficiency reactions in a shorter amount of time[36].In the 1800s, Schiff prepared imine for the first time. He presented the results of his azeotropic distillation-based imine synthesis [37]. Water is eliminated from the system using dehydrating agents like magnesium sulfate or molecular sieves (Figure 1). Subsequently, a multitude of techniques for imine synthesis have been documented. For the procedures for synthesizing SB to be as effective as possible, Chakraborti et al. (2004) state that amines should be strongly nucleophilic and carbonyl compounds should be substantially electrophilic. When an amine and an aldehyde or ketone combine, either through acid or base catalysis or by heating and eliminating water, an SB is created [38-44].

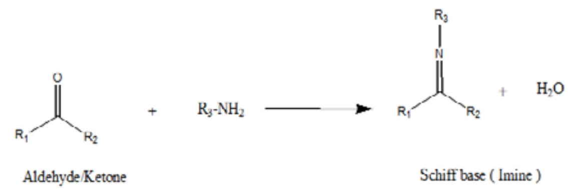


Figure 2: General pathway for synthesis of Schiff base

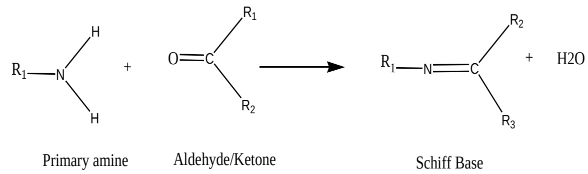


Figure 3- Synthesis of Schiff base

Schiff (1864) reported the first imine production in the 19th century. Numerous techniques for the synthesis of imines have been reported since then. Schiff reports a traditional synthesis in which an amine and a carbonyl molecule are condensed under distillation that is azeotropic. The water that has developed in the system is subsequently totally removed using molecular sieves. Tetramethyl orthosilicate or trimethyl orthoformate, two dehydrating solvents, were used in the development of an in situ water elimination technique in the 1990s. The effectiveness of these techniques is reliant on the employment of extremely nucleophilic amines and highly electrophilic carbonyl compounds, as shown. As a substitute, they suggested using compounds that act as Lewis or Bronsted-Lowry acids to Aldehydes' carbonyl groups are activated, amines' nucleophilic attack is catalyzed, and the system is eventually made dehydrated by removing water. The production of Schiff bases involves the use of Lewis or Bronsted-Lowry acids, such as $ZnCl_2$, and $TiCl_4$ [45]. Figure 4 Bioactive Schiff basesthe group of imines or azomethine found in every molecular structure

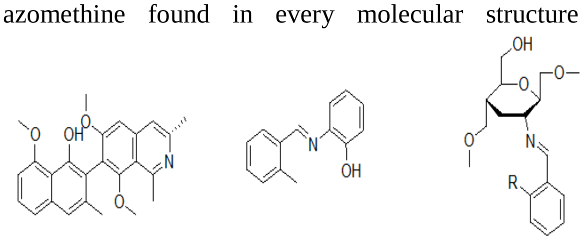
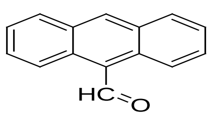
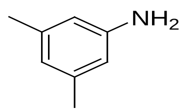
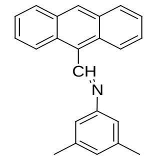
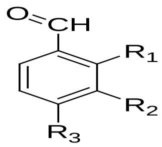
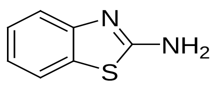
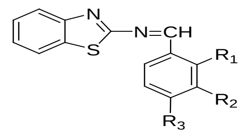
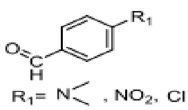
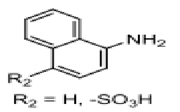
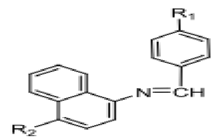
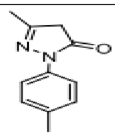
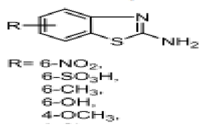
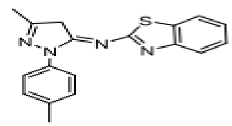
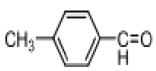
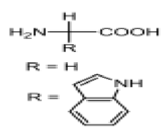
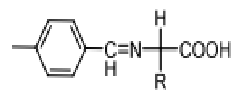
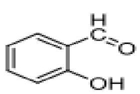
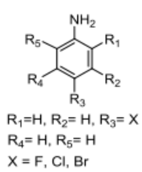
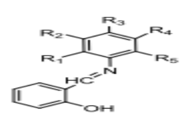
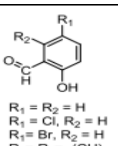
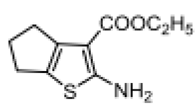
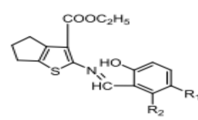
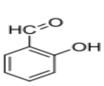
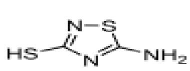
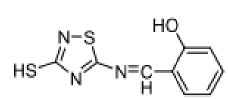


Figure 4: Bioactive Schiff bases the group of imines or azomethine found in every molecular structure

A			Aldehyde: Hot ethanol; Amine at a 1:1 molar ratio; Reflux in 6–8 hours at 70°C		46
B			Aldehyde: Amine in a molar ratio of 1:1; 25 mL of ethanol; Reflux for two hours		47
C			Aldehyde: Pure ethanol; Amine at a 1:1 molar ratio; 60–70°C, stirring for 2 hours and 5–10 hours; NaOH		48
D			Aldehyde: Amine at a molar ratio of 1:1; Reflux;		49
E			Amine (1.2 mmol): Aldehyde (1.0 mmol);KOH; 8 hours		50
F			Aldehyde: Amine at a molar ratio of 1:1; Water, 1-2 hours b) Aldehyde: Amine, 1:1 molar ratio, 50-80°C microwave, 30 seconds to 2 minutes.		51
G			Aldehyde: Amine at a molar ratio of 1:1; reflux, 2–3 hours		52
H			Aldehyde: Absolute Amine at a 1:2 molar ratio; Reflux EtOH		53

Biological applications of Schiff bases

Figure 5: Versatile Biological Applications of Schiff Bases (53)

Antimicrobial activity:

Table 2. Schiff bases possess antimicrobial activity with their effective microorganisms

S. no	Compound Name	Effective cancer cell lines	Ref.
1	1-((pyridine-2-amino) methyl) naphthalene-2-ol	MCF-7, SkBr-3	60
2	2-[6-methylbenzothiazole-2-ylimino] methyl phenol	MCF-7	61
3	3-bromo-2-[6-methylbenzothiazole-2-ylimino] methyl phenol	MCF-7	61
4	2-(benzo[d]thiazole-2-yl)-4-((4diethylamino)-2-hydroxy benzylidene)amino)phenol	MCF-7	62
5	4-[(E)-benzylideneamino]phenol	PC-3 and HT-29	63
6	(E) -4-(2,5-dihydroxybenzylidene)-imino-benzoic acid	MCF-7 and SkBr-3	64

Antibiotic-resistant infections have reduced the effectiveness of antibiotics, even though they are still one of the most effective types of treatment for various diseases [54]. Condensation of is a tin with amino acids, including simple amino acids like glycine, valine, phenylalanine, and cysteine, produced amino acid Schiff bases. leucine and alanine, which exhibited potent antimicrobial properties. The process of creating cellulose-based Schiff bases involves reacting p-aminophenol with aldehyde groups that have been shown to have antibacterial activity against Staphylococcus aureus, Enterococcus faecalis, and Escherichia coli [55].

Biological applications of Schiff bases

3.2 Anticancer Activity

The body's aberrant cells proliferating out of control is called cancer. When cancer begins to grow in the body, older cells do not perish. Rather, they proliferate erratically, producing new, aberrant cells. These aberrant cells cause rapid DNA replication while inhibiting the creation of proteins in regular cells. The most common cancers that strike humans globally comprise cancers of the lung, breast, cervical, and prostate. However, systemic toxicity brought on by the detrimental effects of anti-cancer drugs being distributed non-specifically has seriously hampered its effectiveness. [58, 59]. Even at micromolar concentrations, Schiff bases modified with nitro, halogen, and dimethoxy groups have demonstrated notable anticancer effects. Different substances showed efficacy against the MCF-7 and H-460 cell lines of breast and lung cancer. Certain molecules were created from the condensation of 4-aminobenzoic acid with 2,5-dihydroxybenzaldehyde. Two breast cancer cell lines (MCF-7 and SkBr-3) showed antiproliferative activity in response to acid; the remaining chemicals are mentioned below.

Table 3. Schiff bases possess anticancer activity with their effective cell lines

S.n	Compound Name	Effective Microorganism	Ref.
1	(E)-4-((benzo[d]thiazol-2- amino) methyl)-2-methoxy phenol	S. aureus, Bacilus subtilis, E. coli	56
2	(E)-3-((4-chloro-2-hydroxy benzylidene)amino)-5-hydroxybenzoic acid	A. niger	56
3.	(E)-4-((4-chlorobenzylidene)amino)phenol	A. niger, Chalara Corda	56
4.	2-[6-methylbenzothiazole-2-ylimino] methyl phenol	A. niger, C. albicans	57

3.3 A ntioxidant Activity

Chemicals known as antioxidants prevent other molecules from oxidizing and damaging cells. An oxidizing agent and one molecule exchange electrons during the chemical process of oxidation. It is known that oxidation reactions result in the production of free radicals. The outermost shells of these highly reactive free radicals have one or more electrons that are not coupled. When they start to form, the chain reaction starts. When an antioxidant interacts with these free radicals, it oxidizes itself to inhibit further oxidation processes and breaks the chain reaction by removing the intermediate free radicals. Oxidative stress has a significant impact on a wide range of human diseases, such as inflammatory disease, Parkinson's dementia, Alzheimer's disease, cancer, neurological disorders, and cellular necrosis. In comparison to compounds with hydroxyl groups in other places, those with hydroxyl groups in the aromatic ring's para position have superior radical scavenging action. Numerous substances with pyrazole moiety have potent antioxidant properties, and the remaining substances were supplied below .

Table 4 : Schiff bases possessing antioxidant activity

S.no	Compound Name	Ref.
1	2,4-dichloro-2-[1-(propylimino)ethyl]phenol	65
2	4-(1H-Indol-3-ylmethyleneamino)-1,5-dimethyl-2-phenyl-1H-pyrazol-3(2H)-one	66
3	(1E,2E)-N-methyl-3-phenylprop-2-en-1-imine	67
4	Cholesteryl-4-(4-((E)-(4'-cyanobiphenyl-4-ylimino)methyl)phenoxy)butanoate	68

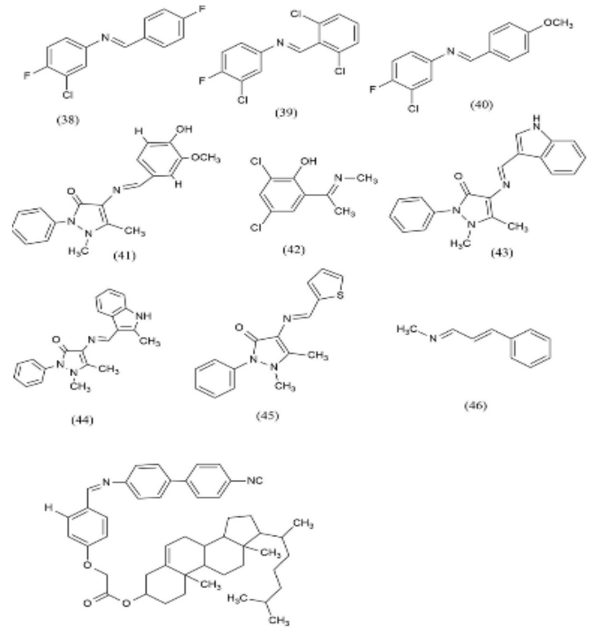


Fig 6 : Compound possessing antioxidant activity

3.4. Anti-inflammatory Activity

The FDA has approved the use of NSAIDs as analgesics, antipyretics, and anti-inflammatory drugs. Because of these effects, NSAIDs are used to treat a wide range of illnesses, such as migraines, pyrexia, gout, muscle pain, dysmenorrhea, arthritic problems, and in certain circumstances, severe injuries, as a medication to spare the opioids. The specified mixtures were created by the 2-(2-aminophenyl)-N'-[(Z)-phenylmethylidene] is a condensation of pyrazole derivative with aromatic aldehyde that exhibits strong anti-inflammatory activity against COX1 and COX-2. acetohydrazide [69], which is highly active against 4-((Z)-5-((Z)-2-(benzo[d][1,3] and COX-2.3-(phenylamino)allylidene, 5-yl(imino)methyl, and dioxolThe COX-1/COX-2 inhibition of 4-oxo-2-thioxothiazolidin-3-yl)benzenesulfonamide [70] shows good selectivity. 2-benzyl-4-{(E)- [methylidene (3,4-dihydroxyphenyl)]The compound 50, amino-1,5-dimethyl-1,2-dihydro-3H-pyrazol-3-one, exhibits anti-LTS-stimulated COX-2 mRNA levels . The chemical structures of the substances with anti-inflammatory properties are listed in Figure 7.

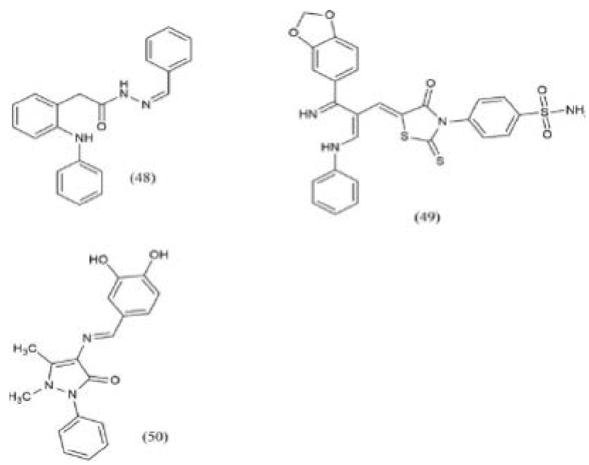


Figure 7: Compounds possessing anti-inflammatory activity

3.5. Antimalarial Activity The infectious disease malaria is caused by the plasmodium species, most commonly Plasmodium falciparum. The compounds that possess antimalarial activity are shown in Fig. 8 and (E)-2-(2-(4-bromobenzylidene)hydrazinyl)-N-(4-((7-chloroquinolin-4-yl)amino)phenyl)-2-oxoacetamide (53) and 2-{(2E)-2-[(4-bromophenyl)methylidene]hydrazinyl}-N-{4-[(7-chloroquinolin-4-yl)amino]phenyl}-2-oxoacetamide (54) were used against a specific strain of 3D-7 P. falciparum [70].

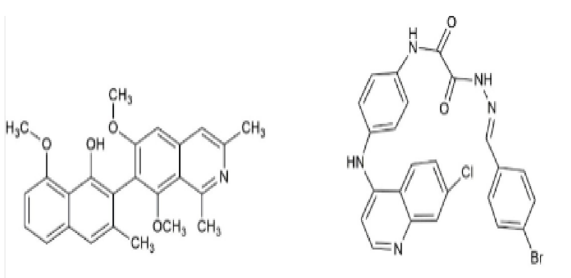


Figure 8 : Compounds possessing antimalarial activity

3.6. Neurodegenerative Disorder (Alzheimer's Disease) Alzheimer's disease (AD) is a neurological condition that leads in dementia. One of its main causes is the creation of extracellular amyloid-b peptides. The list of Schiff base compounds that have a potent inhibitory effect on Alzheimer's disease is provided below. These substances are created when amine and aromatic aldehyde condense to produce Schiff base compounds. N'-[(1E)-1-ethylidene (5-bromo-2-hydroxyphenyl)] Human acetyl cholinesterase is inhibited by -3,4,5-trihydroxybenzohydrazide (51) and is used to treat Alzheimer's disease. N'-(2,6-dimethoxybenzylidene)-2-hydroxybenzohydrazide (52) inhibits both acetylcholinesterase and butyrylcholinesterase [21,31]. Fig. 7 lists the substances with anticholinesterase activity (63).

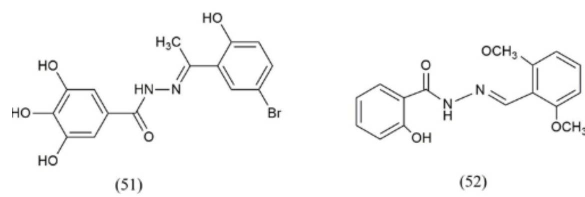


Figure 9: Compounds possessing anticholinesterase activity

Conclusion

This article provides an overview of the many biological activities of Schiff bases and their derivatives. The Schiff base and its derivatives were a significant class of molecules in synthetic chemistry with pharmacological effects that included antibacterial, anti-inflammatory, antimalarial, anticancer, and antioxidant properties. In medicinal chemistry, Schiff bases have emerged as promising candidates for drug development due to their ability to interact with biological targets, exhibit pharmacological activities, and mitigate various diseases. Their structural flexibility allows for the rational design of compounds tailored to specific targets, offering a pathway towards novel therapeutics.The catalytic properties of Schiff bases have been harnessed in organic synthesis, enabling efficient and selective transformations. Their adaptable structures allow for the creation of catalysts with tunable properties, facilitating advancements in synthetic methodologies and green chemistry.

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Artificial Intelligence: Opportunity, Challenges and Impact of Society-2024

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Abstract
Artificial Intelligence (AI) tools such as Chat GPT and Open AI among others, are likely to transform the way we live, work, and interact with each other. It will impact on our society positively and negatively. In this article, the opportunity and challenges of artificial intelligence in various sectors and its positive and negative effects on society are mentioned. AI provides assistance in the management of healthcare care, early diagnosis, documentation, and robotic surgery, thus improving the quality of social work. Contributes to the financial sector and improves the customer experience by facilitating artificial intelligence, market analysis, mobile banking, and digital payment systems in the financial sector. artificial intelligence in education; Provides advanced teaching to students by using data mining, intelligent teaching platforms, and personalized learning systems. Increasing productivity, increasing revenue, creating new jobs, and reducing human error are the positive effects of artificial intelligence. Artificial intelligence has positive and negative effects. Layoffs, reductions in the labor market, privacy protection issues, and inequalities are among the negative effects of artificial intelligence. For this reason, artificial intelligence must be created within ethical frameworks and contribute to society.

1. Introduction

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines, enabling them to perform tasks that typically require human intelligence. Humans have long had an infatuation with Artificial Intelligence. Allan Turning initially used the term Artificial Intelligence (AI) in his 1950 essay "Can a Machine Think? ". The vast area of computing that aims to give machines the appearance of human intelligence, known as AI, has become its focus. Arthur Samuel defines self-learning computers as those that can learn without being explicitly programmed.ML discovers the development of step-by-step procedures for teaching machines and forecasting future data.ML is a rapidly growing technology that's powered by Deep Learning. It is a new area that signifies its true bleeding edge. In recent days, ML is one of the rising fields due to its success having been authenticated in different applications. In today’s word. AI is pervasive and transforming various aspects of society, including: Technology, Healthcare, Finance, Business, Education, Entertainment, Security, Transportation. Overall, AI plays a crucial role in shaping the way we live, work and interact with technology, with its impact expanding across diverse sectors of society. In this article we present AI’s numerous opportunities for enhancing efficiency, productivity and decision making processes across diverse sectors. We also discuss challenges that must be addressed to ensure responsible and ethical deployment. Here we also mention the widespread adaption of AI has profound societal implications, influencing various aspects of human life and interaction.

Litratute Review

Driver free vehicles are functioning with the support of GPS and sensors that used to identify the correct direction and track the way automatically. The driver free vehicles can drive to anywhere in the city having road connectivity. Highly stylish designed system control with the help of software and algorithm that reads by sensors gather information to recognize and identify the correct path. The advanced control vehicle systems that capable of taking in sensory data to distinguish different objects in the environment and differentiate the vehicles, public and other objects in the nearby environment which will be more helpful for plan the desired destination. A Genetic Algorithm based on fuzzy optimization was used to reduce the number of wasted resources, energy usage, and thermal indulgence prices. The cloud resource allocator forecasts with the help of the Fourier transform to authenticate the signature that can be used to predict the future demands. The researcher explained security related problems in artificial intelligence, particularly in supervised and reinforcement learning algorithms. Based on machine perception, AI, ML and deep learning are working. A new wireless radio technology paradigm is needed for next-generation wireless networks to accommodate extraordinarily high data rates and fundamentally new applications. The difficulty lies in helping the radio to make intelligent, adaptive learning and decision-making decisions so that the many needs of next-generation wireless networks can be met. Researchers find that the theoretical maximum prediction is as high as evaluating the uncertainties of movements using entropy and taking into account both the frequency and temporal correlations of individual trajectories. It has been proven that Predictive Resource Allocation (PRA) can deliver videos smoothly with few unfair pauses. One of the most promising artificial intelligence methods, machine learning was developed to assist smart radio terminals. It is the ability to understand sensory data. The first was a series of approaches similar to genetic algorithms that made their Map Reduce environment more difficult. The second was unclean data with potential errors. AI was applied to spot the clean, dirty data as a means of creating contextual knowledge of the data. Third was a data visualization and the larger flash store technology, which deals with the real time oriented decision making process for solving various crucial problems.

Opportunity Of Artificial Intelligence:

The opportunities presented by AI are vast and diverse, ranging from automating repetitive tasks to revolutionizing healthcare, transportation, technology and business. AI can enhance efficiency, improve decision–making and unlock new insights from data. Optimizing business processes and workflow is a key opportunity offered by AI. In fact, the relationship between businesses, employees, and customers is fundamentally changing as a result of the rapid development and widespread application of Artificial Intelligence (AI) and other ground-breaking technologies and the automation of the administrative aspects of HRM activities and tasks is intensifying. Robotics entails the design of tools that can imitate human movement and behavior. To put it briefly, the science of robotics is a collection of disciplines that include artificial intelligence, machine learning, electronics, nanotechnology, and many more. Through the screening process provided a summary of the state of the art on this subject were found. In the field of pharmaceutical and medicine, AI could usher in a future of innovation ina future of innovation in diagnosis and could reshape the field of patient treatment care. AI could help medical providers identify medical markers quicker and better. Nurses, doctors, and hospital administrators can improve the medical care chain. It could cut costs, improve outcomes, and make for a more productive and efficient healthcare delivery system. An AI tool such as IBM Watson can provide diagnosis and data analysis faster. AI machine learning algorithms can process large amounts of data quicker and make more accurate and targeted treatment possible, thus reducing medical costs along the medical value-added chain. Moreover, AI could also improve medical revenue generating systems for hospitals through the organization of medical records. It could process medical test results faster, and allows doctors and healthcare providers to have more autonomy and better workflow, and improve patient-doctor interactions and allow for nurses and doctors to spend more time with patients. Moreover, during medical surgery, physicians can rely on multidimensional imagery to guide and improve surgical procedures. Also with AI, charts and documents can be reviewed faster and in real time to deliver better treatments. Hospitals using electronic medical records could benefit significantly by using AI tools. Drug manufacturers can also benefit from data analytics so that they can bring drugs to market faster. The development of the COVID-19 vaccine by Johnson & Johnson was brought to market faster with the help of AI analytics. The National Science Foundation is cooperating with Cornell University School of Chemical and Bio molecular Engineering to advance research on how to modify the polymer nano particles to make it possible to target cells in patients and bring about specific treatments with the help of nano medicine solutions. Overall innovations in the healthcare delivery system and the pharmaceutical industries are very promising and will grow immensely with AI tools. Today we are living in the computing era. The usage of storage as a service leads to generating a humongous amount of data. Recent growth in computing power with the help of development in the application of algorithms which can be utilized to get insights from the huge amount of data being produced Its other applications are in the media, entertainment and communication, finance and security, health care, education, public service, insurance, marketing, wholesale trade, transportation, energy and utilities, manufacturing, and natural resources. In multimedia organizations, it helps to analyze client information along with behavioral data to create in-depth client profile data. For Finance and Securities, the financial market activities are monitored by the Securities Exchange Commission (SEC) using big data. The SEC, with the help of natural language processors and network business analytics, assists in forecasting the future market with capital and money markets. It aids in the prediction of trade decisions, business analytics processes, credit risk rating, risk factor analysis and scoring, sentimental based investor types, predictive analytics, and so on. Unaudited money, not properly disclosed money, and risk management are exploited using big data analytics. With the help of using big data for clinical trial data analysis, disease pattern identification, patient database maintenance and analysis, medical device and pharmaceutical items, logistics management, new drug discovery and development analysis, etc. With the development of mobile health apps, doctors can provide evidence-based medicine. Health-related communicable diseases are identified with the help of social media.

It is applied in the education system in the United States, using big data to measure the performance of educators and learners. Students are checked to measure how long they are taking to learn new things. The University of Tasmania in Australia, with more than thirty thousand learners, has installed and is learning through a library management system to retrieve the status of educators and learners who are involved in on-line sessions.

In public services, big data is employed for environmental protection, women's and child welfare, environmental change detection and management, human resource management, etc. In the retail industry, AI joined with big data is used for analysis of basket analysis, customer segmentation, customer loyalty programs, logistics management, and behavior-based targeting.

Challenges In Artificial Intelligence:

The most challenging tasks of ML and AI are data availability and fatigue due to some technological errors. AI is mainly applied to identify fraud, customer data renovation, trading using social analytics, industry credit risk reporting, trading and auditing perceptibility etc. Securing health care data, accessing reliable information and e-governance are the big challenges in big data analytics. Data are heterogeneous in that they are uneven, isolated, and rarely standardized. Incorporating the data from different sources is the most significant and sensible problem in the education sector. However, they are essential to the use of data for study in the field and do not exhaust the ethical challenges appearing in AI-driven digital pathology. Currently, medical data sharing ethics tend to concentrate on privacy concerns in order to safeguard the interests of specific study subjects. However, a larger perspective is required when considering the ethical issues associated with sharing pathology data, which means that digital pathologists must also improve their commitments to choice, equity, and trust. Though the problems are complex and call for constant discussion among researchers, it's equally critical to keep in mind the significance of patient and public involvement and engagement (PPIE) in this whole process.

The findings demonstrated that one of the most significant obstacles to adopting a system based on the requirements of the digital transformation is the lack of sufficient infrastructure. This component might be one of the prerequisites for using any other technology at all. As a result, many businesses decide against implementing without the requisite infrastructure (technological and technical, as well as the lack of necessary preparation in the organization to accept technology). One aspect of organizational maturity that supports this option's high ranking is its infrastructure. Given the existence of the Internet and network technologies, it is clear how significant cyber security - related difficulties may be a Security challenges are ranked second.

Protecting the privacy of the users also poses more. The key challenges in the retail industry encompass understanding customers by creating a single view across multiple sources of customer information from point of sale, loyalty program, social media, etc. In the field of Big Data visualization, they are facing the issues like the efficient data processing techniques which require order to enable real time visualization and the cost incurred to procure and manage the devices for large scale. In business analytics AI is applied with the help of Cloud Computing, even human cannot easily replace by ML and Big Data analysis. In certain scenarios, at the end of every problem, it can solve human analysts to stay in the loop. In self driving vehicles, typical automotive safety arguments and discussions for the low integrity devices can really pivot upon the ability of a human driver to control the vehicle. For example, if a small or a major software problem or error causes a potentially dangerous situation for the driver and the surrounding, the autonomous vehicle might be normally to override and recover to a secure state without much trouble. Suppose if any unexpected failure occurs then who is liable to recover from significant vehicle mechanical failures like tire blow outs, faults in engine and steering problem and in the braking system. The driver is completely liable for driving the vehicle in the correct direction.

The number of problems related to AI algorithms in genetic algorithms is greater because there are a greater number of iterative steps for map reduce followed, making it a more difficult one. Unclean or dirty data leads to errors or inexact information. AI is used to detect dirty data by means of ascertaining the context data from the database. As the memory size increases, the customer is facing a challenge in analyzing the big databases and quick decision-making ability. Finally, the information available in signal or text format is processed. The researcher tries to find a solution for processing the audio and video-based data. The proliferation of AI-based HRM applications over the past ten years has sparked a fascinating new line of inquiry into issues including the societal impact of AI and robots, the consequences of AI adoption on both human and corporate results, and the assessment of AI-enabled HRM practices. Adopting these technologies has changed how work is organized in domestic and foreign businesses, presenting chances for staff members and businesses to utilize resources and make decisions and solve problems. However, despite an increase in scholarly interest, there has been little and inconsistent research on AI-based HRM technology. Additional study is required to examine the function of AI-assisted HRM apps and human-AI interactions in major multinational corporations spreading such breakthroughs.

It’s Impact On Our Society:

AI brings many benefits to society, the first of which is to increase productivity and efficiency by automating the easy workforce of artificial intelligence, reducing human error, and improving resource utilization. The second is the benefit of generating income in the technology market. With the widespread use of artificial intelligence technology, the income of companies with artificial intelligence technology that invest in and research this subject will increase. Third, we can talk about its positive effects on the labor market. With the increase in the usage areas of artificial intelligence, machines start to do some or even all the workload of employees. Although this brings with it the concern that people will be removed from their job potential, artificial intelligence has potential, such as creating new job roles, direct innovation, and increasing human skills. Finally, artificial intelligence provides a safer experience by reducing human-induced errors. We can give road safety as an example of this experience. Artificial intelligence contributes to increasing transportation safety by improving road safety with optional solutions.

Artificial Intelligence has profound impact on society from revolutionizing industries to transforming daily life. It enhances efficiency, productivity, and convenience across various sectors such as healthcare, finance, transportation and entertainment. However, it is also raises concerns about job displacement, data privacy, algorithmic bias, and ethical implications, necessitating careful regulation and responsible deployment to ensure its benefits maximized while mitigating potential risks.

The impact of AI on society is both exciting and challenging. AI has the potential to transform the way we work communicate, and interact with technology, but it also raises concern about the displacement of jobs, bias and discrimination and the potential for misuse or abuse.

Conclusion:

In conclusion the opportunities presented by AI are vast, promising enhanced productivity, innovation, and quality of life. However, these opportunities come with significant challenges, including job displacement ethical dilemmas, and the exacerbation of social inequalities. The impact on society is profound, requiring thoughtful consideration, proactive regulation and inclusive strategies to harness the benefits while mitigating the risk, ultimately shaping a future where AI serves the collective good. As a result, artificial intelligence has created a technological revolution thanks to its developments. In addition, it has benefited society with the applications it has developed for various sectors. The positive effects of AI have increased productivity and efficiency, increased revenue for companies with AI technology, created new job roles, driven innovation, and reduced human error. But challenges such as layoffs, labor market disruptions, privacy issues, and gender-based and economic inequalities require attention. AI technologies must be created within ethical frameworks and must address social issues.

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Artificial Intelligence Technology's Application in the Manufacturing Process, Purchasing and Supply Management

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Abstract
The increasing complexity and interconnectedness of modern manufacturing and purchasing and supply management (PSM) systems are driving technological advancements in these sectors. Recent progress in artificial intelligence (AI) and the vast amounts of generated manufacturing data, known as big data, enable the integration of advanced analytics tools into the supply chain, optimizing production processes. This paper focuses on the application of AI systems in manufacturing and PSM processes within factories, leading to concepts such as smart factories and smart manufacturing. These advancements are reshaping and digitizing production floors, traditionally reliant on human labor.

1. Introduction:

The objective of this study is to provide insight into the development of applied artificial intelligence (AI) technology in factory settings, focusing on its techno-economic aspects. The fourth industrial revolution serves as a key driver for advancements in applied AI, marking a significant progression from previous industrial eras. While the industrial revolution of the 1800s introduced water and steam-powered machinery to support labor efforts, Industry 3.0 saw the emergence of the first industrial robot by General Motors in 1961. With Industry 4.0, terms like machine learning and artificial intelligence have gained prominence, alongside the rebranding of older concepts as SMART factory, SMART manufacturing, SMART warehousing, SMART production, and SMART supply chain. These concepts are being enhanced through the application of artificial intelligence, machine learning, and deep learning, with the aim of making processes more intelligent. Cyber-Physical Systems (CPS) play a crucial role in this advancement, integrating computer-based algorithms with the physical world through powerful sensors, enabling real-time data access and processing. Data-based decision making, facilitated by big data, streamlines decision-making processes, particularly in Supply Chain Management planning. Artificial intelligence, including its subclasses, emerges as a pivotal success factor in these processes, aiding in optimal and dynamic product routing in supply chain management. While the integration of AI offers numerous benefits such as process optimization and cost reduction, it requires significant investment of resources and time to fully realize its potential. In the early stages of industrial robotics, their capabilities were limited due to being tailored for singular tasks. However, the industrial sector is now advancing towards what's termed as Industry 4.0, a concept initially introduce by Klaus Schwab, a German engineer and economist, in 2015. Industry 4.0 encompasses the utilization of data-sharing technology, integrating advancements such as the Internet of Things, cloud computing, and artificial intelligence.

One potential scenario involves a sensor detecting equipment malfunctions on the factory floor, with data instantly transmitted via cloud storage to flag the issue and initiate automatic repairs. This real-time monitoring and response system promises significant productivity enhancements throughout the manufacturing process, necessitating factory workers to adapt and upgrade their skills as automation and digitalization become more prevalent. This paper aims to contribute to industry development by providing an overview of current and upcoming AI innovations in manufacturing, assisting industry leaders in evaluating technology adoption. Additionally, it seeks to support the ongoing technical development of factory workers by highlighting technology trends and areas for skill enhancement. Leaders across various industries can also benefit from insights into the adaptability and potential investment value of emerging technologies for optimizing their supply chains. Furthermore, non-specialists in AI technology will find the paper valuable for gaining sufficient knowledge and facilitating their learning journey into AI advancements. This paper thus seeks to address the following research questions: What is the application of artificial intelligence technology in the manufacturing process and the purchasing and supply management? The paper begins by exploring the broader concept of change processes and their impact on the manufacturing industry due to technological advancements. It then delves into the historical evolution of computers within manufacturing, followed by a brief overview of the evolving role of human workers in the context of smart manufacturing. The discussion also addresses the shifting responsibilities of factory workers amidst these developments. Subsequently, the paper examines the practical applications of AI in manufacturing, highlighting how it facilitates process optimization through automation and its effects on purchasing and supply management. Finally, the paper concludes with insights into future prospects in this evolving landscape.

2. Computer's history in the manufacturing process: In the quest for streamlining manufacturing, entrepreneurs pinpointed automation as the primary driver. Subsequently, the mechanization of these processes was facilitated by central computers and dedicated integrated circuits. This section offers background information to comprehend the evolution and impact of automation technology

2.1. Mechanization and rationalization

Until around fifty years ago, automation was largely inter changeable with mechanization. Manual labor was replaced by machinery and other technical tools, resulting in both advantages and disadvantages. The benefits included increased efficiency, but drawbacks such as high costs and machinery inflexibility were also evident. Notably, entire manufacturing lines often required reconstruction to accommodate new products, leading to a significant adoption of mechanization, particularly in industries with mass production like automotive manufacturing.

2.2.Birth of computers and integrated circuits

Herman Hollerith, a pivotal figure in the history of automation, significantly contributed to the development of the modern computer. His groundbreaking work revolutionized the American population census of 1890 by introducing a punch card system. This system, comprised of perforated cards and wire brushes, facilitated automated data processing, marking a departure from manual counting methods. When the brushes encountered holes in the cards, electric circuits closed, enabling data interpretation. Hollerith's innovation laid the foundation for the establishment of the IBM machine corporation. The electric machine in the 1950s and the integrated circuit in the 1970s were two developments that brought a new change in industrial technology.

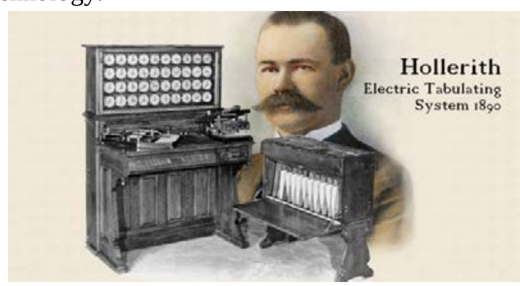

Figure 1: Herman Hollerith and his electric tabulating system

The section highlights the ongoing process of work and manufacturing radicalization through technology, which began in the past and shows no signs of halting. Applied AI is poised to significantly impact factory workers' lives, alter manufacturing processes, and reshape the overall structure of factory shop floors.

3. The human factor in smart manufacturing

Warren G. Bennis, a renowned US organizational consultant, once envisioned the future factory with just two occupants: a human and a dog. According to Bennis, the human's duty would be to feed the dog, while the dog's responsibility would be to prevent the human from interacting with automated systems . This concept resonates with many industrialists and experts who foresee Industry 4.0 being driven by advanced AI tools, transforming manufacturing and distribution processes with a focus on human motivational factors . In this paradigm, humans are expected to assume supervisory roles and ensure product quality, while robots handle labor-intensive tasks either independently or in collaboration with humans. Achieving a harmonious balance between humans and robots remains a significant challenge. Consequently, considerable attention is being devoted to human-robot collaboration (HRC), with various institutions worldwide exploring innovative approaches. Researchers emphasize the importance of intuitive human-computer interfaces and effective task allocation between humans and robots for the success of HRC. Multimodal fusion systems, integrating technologies like speech and motion recognition, aim to strike the optimal balance between human intuition and robot precision.

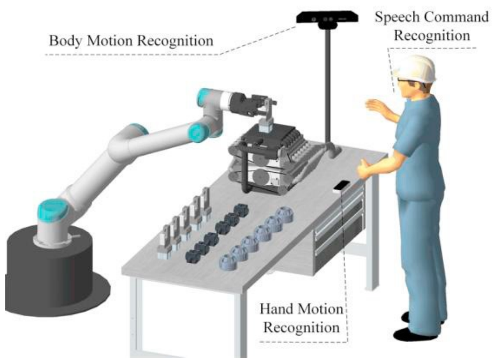

Figure 2 :- Multimodal human-robot collaboration enabled by speech command, hand motion and body motion recognition systems.

Despite the apparent diminishing role of humans in Industry 4.0, certain human skills remain essential. While new job prospects will emerge, human involvement, particularly in interpersonal interactions demanding psychological and emotional aptitude, remains crucial. Physical labor will largely transition to planning and managerial duties. Nonetheless, human presence remains vital for maintaining and innovating smart systems, necessitating the acquisition of new skill sets like data management and technical competencies linked to data. Moreover, fostering an open culture regarding ongoing AI projects is imperative.

4. Advances of applied artificial intelligence associated to the smart manufacturing concept :

Combining data analytics with AI technology has the potential to enhance efficiency, product quality, and safety in the production process. Consequently, the manufacturing sector emerges as a primary driving force behind the advancement of applied AI technology. Within these sectors, four specific areas undergoing rapid digitization and optimization, significantly influenced by AI algorithms, are being examined.

4.1. Quality assurance inspections

Utilizing advanced imaging technology, companies like BMW and Canon have employed artificial intelligence solutions to identify inconsistencies and defects beyond human detection. Bosch integrated AI into their manufacturing, enhancing cycle time, defect detection, and quality inspection, leading to a 10% CO2 emission reduction and a 45% decrease in testing time, saving $1.3 million. The new AI systems ensure a 0% defect escape rate and less than 0.5% false alarm rate, contrasting with the 20-30% error rate with human inspectors due to optical illusions and imprecisions. Consistent quality from such systems boosts customer satisfaction while reducing production time and costs. Various machine learning approaches, like supervised learning, aid in quickly identifying defects, though challenges arise when unforeseen states occur. Clustering methods of unsupervised learning can handle such cases, finding patterns in data without predefined output, thereby facilitating effective subdivision.

4.2. Preventative maintenance

One significant advantage of preventive maintenance is its ability to forecast when a mechanical component might need replacement. By integrating historical data, machine learning generates an algorithm that identifies potential issues as they arise, enabling organizational experts to address them promptly and prevent delays or disruptions in development. In preventive and predictive maintenance, statistical methods have been used for some time in making decisions. In areas with many variables, machine learning methods such as neural networks can be used for classification. Angius et al. (2016) demonstrated that the implementation of policies in such systems can be inadequate, potentially impacting the timely completion and delivery of customer orders. Hence, it is essential to assess not only the machine condition but also the effect of these system policies on the service level before their selection [20]. A visual representation of the workflow is depicted in figure 4.

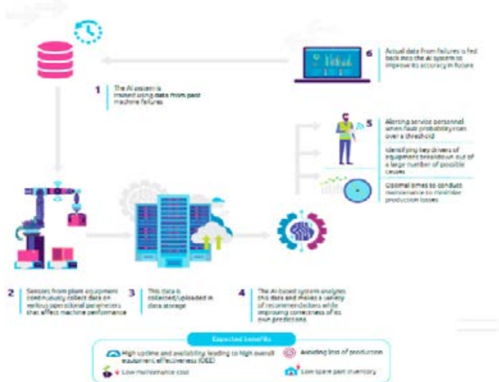

Figure 3 ; Usage of AI for intelligent maintenance in manufacturing.

4.3. Predictive forecasting

In today's dynamic economic landscape, maintaining competitiveness requires businesses to closely monitor even minor shifts in market trends. These shifts can signal significant future fluctuations in demand, potentially leading to serious production challenges upstream. AI algorithms can manage all aspects of purchasing and supply management systems, helping organizations prepare for demand changes that might disrupt production and delivery. Mahya et al. (2020) highlight that conventional supply chain management assumptions often overlook uncertainties in demand, costs, and capacity, leading to various risks such as consumer demand fluctuations, product distribution issues, and operational risks. By anticipating market changes, businesses can enhance resilience and allocate resources more effectively, adopting a proactive approach. Tarallo et al. (2019) emphasize the importance of detailed market prediction, especially for fast-moving consumer goods. AI-driven sales forecasting outperforms traditional statistical methods for perishable items, optimizing inventory, reducing stock-outs, improving supply chains, and boosting profitability.

Reinforcement learning algorithms excel in market predictions, particularly in domains like stock markets or cryptocurrency exchanges, where trading bots employing deep reinforcement learning have proven effective. Unlike other machine learning methods, reinforcement learning algorithms can yield promising outcomes with less data. This approach mirrors human learning behavior, focusing on discovering optimal strategies through trial and error. The learner, or agent, interacts with an environment, receiving rewards for actions taken. The agent's objective is to maximize these rewards, adapting to the market dynamics. In this context, a reinforcement learning approach involves a clear setup: the agent represents the trading bot, the environment signifies the market, and the rewards reflect the generated profit or loss.

4.4.Real-time monitoring

Real-time monitoring stands out as a significant advantage of AI in manufacturing, offering precise insights into production inefficiencies and bottleneck causes. This capability enables swift identification of areas needing adjustment, leading to prompt issue resolution and resulting in savings in time and costs. Kumar et al. (2018) demonstrated the benefits, highlighting cloud manufacturing as a method for real-time monitoring that enhances resource efficiency by accurately assessing machine status. It minimizes system downtime through condition-based tracking using sensor data analysis. This data is then shared via machine-to-machine communication protocols and cloud service data retrieval methods. Furthermore, this approach benefits small and medium-sized enterprises (SMEs) within the network, fostering collaboration and facilitating cost-effective production services with short lead times.

4.5. Supply chain management

Machine learning (ML) systems and neural networks offer significant value in supply chain management. In this realm, techniques like linear regression can predict the bull-whip effect's impact. Decision trees and random forests aid in lead scoring for resource allocation by supply chain managers. Neural networks analyze customer-seller audio and video communications, aiding lead time planning and adjustment. ML optimizes decision-making in goods and services flow, yielding time and resource efficiencies. Statistical methods, extended by ML, enhance planning processes, especially for non-linear problems. Despite clear benefits, only 15% of companies apply ML in supply chain functions, possibly due to data scarcity or lack of awareness. These advancements affect purchasing, supply management, and personnel deployment, promising system enhancements.

Purchasing

The procurement divisions of corporations generate vast amounts of data, yet often fail to fully harness its potential due to resource constraints or limited understanding. Additionally, procurement landscapes are evolving, with markets becoming larger, more intricate, and highly competitive. This is where AI and ML become invaluable. Traditional decision-making methods can be enhanced through neural networks, such as the decision tree, a pivotal tool in supervised learning. Incorporating AI into procurement often involves automating and streamlining processes, akin to techniques used in supply chain management. Globalization has expanded market diversity, making it challenging for humans to navigate. Here, neural networks play a crucial role by categorizing offerings based on specific attributes, facilitating autonomous or simplified decision-making. Leveraging such methods can offer companies a significant edge over competitors.

5. Conclusion

The integration of artificial intelligence (AI) finds a natural fit in both the manufacturing sector and purchasing and supply management. Despite Industry 4.0 being in its early stages, significant advantages of AI are already evident. This technology aims to permanently revolutionize how we manufacture goods and handle materials, spanning from design and production floors to supply chain logistics and administration. Given this transformative potential, it's imperative to emphasize the inclusion of AI in the educational curriculum of technical fields. This ensures that future professionals are equipped to adapt to and leverage AI advancements in manufacturing, procurement, and supply chain management, thus fostering a forward-looking approach in education.

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Design And Development of Punch-Die Assembly for Compaction of Metal Powders By Using Ansys Software And Cnc Machine

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Abstract:
A compaction die has vital role in the powder metallurgy process due to the controlling and ease of processing. It is being followed from an ancient era till now like Ashoka pillar in Delhi, bushings, bearings etc. This process is material and energy-efficient compared with other metal-forming methods. Powder metallurgy is remunerative for making complex-shaped parts and reduces machining. This work is an attempt to design and manufacture a compaction die that can successfully use for uni-axial compression of powder. The design and development of die includes design consideration, 2D drawing, 3D model and processes involved in the fabrication of die. The die design was analyzed by ANSYS software and program thus generated is executed by CNC machine in a simulated environment, and the fabricated die was tested experimentally by producing the blended sample successfully at 1000MPa compaction pressure using universal testing machine. Further, the compaction behaviour, density, compressive strength, and hardness of developed parts also evaluated.

1. Introduction

Most alloys and composites are developed using Powder Metallurgy (PM). It is the process in which Powdered materials are mixed, compressed into the desired shape, and then heated to bind the particles together. Due to the ease of processing and control, it can also be used to fabricate specially designed materials and parts that are difficult to manufacture with other processes such as melting or forming. This process reduces the cost by reducing the need for metal removal. Moreover, a PM process avoids material changes in the solid-liquid phase, which could lead to component degradation or dissolution. Due to the controlled characteristics of the products produced by powder processes, powder processes are more flexible than other production methods such as casting, extrusion, and forging. According to several studies, the PM process effectively manufactures porous solids, aggregates, and inter metallic composites with improved material characteristics. Several methods can process the powder, but uni-axial compaction is the simplest. The powder is compacted in uni-axial compaction by applying high pressures to the metal powder in a tightly sealed chamber. It is common for the metal powder to be compressed at pressures ranging from 150 MPa to 1000 MPa. This is generally accomplished by holding the die vertically with the punch. Following the powder pressing process, the powder is ejected from the die chamber, and a controlled environment is used to sinter the material at a specific temperature. A significant limitation of pressure compaction is its tendency to produce green compacts with high porosity and circumferential micro cracks resulting from friction between the die wall and the composite particles. Micro cracks originate during the compaction step in PM-processed components and are widened during sintering. This research seeks to develop a pressure compaction die that compacts metal powder with minimum porosity and micro cracks. By applying maximum pressure through a universal testing machine, the performance of the die has also been tested by analyzing the compaction behavior of metal powder, the porosity produced during compaction, and its mechanical properties.

2. Powder Metallurgy:

It is desirable to design engineers that steel injection molding or press and sinter processing can replicate elements in massive volumes. The ability to manufacture complex shapes to final size and shape or near-net-shape is precious. Powder metallurgy offers the potential to try this in high volumes and applications wherein the volumes are not so massive. The three important reasons for using PM are not pricey, precise, and captive packages. For some packages requiring excessive volumes of high precision components, the value is the overarching issue. An extraordinary example of this phase is parts for the automotive enterprise (in which about 70% of PM structural parts are used). Powder metallurgy parts are utilized in the engine, transmission, and chassis programs. Now and then, it's far a unique microstructure or property that leads to PM processing: for example, porous filters, self-lubricating bearings, and cutting tools from tungsten carbide or diamond composites. Captive PM applications include tough substances to procedure through different approaches, including refractory metals and reactive metals. Other examples are unique compounds, including molybdenum di silicate, titanium aluminide, or amorphous metals. The metal powder enterprise is an identified steel forming generation that competes directly with different metalworking practices, including casting, forging, stamping (best blanking), and screw machining. The industry incorporates powder suppliers and parts makers, the corporations that supply the combination device, powder handling with equipment, compacting presses, sintering furnaces, etc. Powder metallurgy is price-effective for making complicated-formed elements and minimizes machining time. An extensive range of engineered substances is to be had, and the desired microstructure may evolve via suitable material and procedure choices. Powder metallurgy components have the right floor finish, and they will be warmness-treated to increase strength or wear resistance. The PM method gives element-to-part reproducibility and is ideal for mild-to-excessive extent production. Where essential, controlled micro porosity can be supplied for self-lubrication or filtration. While dimensional precision is perfect, it usually does now not shape machined components. Inside the case of ferrous PM parts, they've lower ductility and reduced effect resistance than wrought steels. Maximum PM Components are porous, and attention must be given to this when completing operations. Metallic powders come in many exceptional sizes and shapes. Their shape, length, and length distribution rely upon their manufacturing.

The Compacting Cycle: Three stages comprise the compacting process:
(a). Filling the die,
(b). Densification and granulation
(c). Separating the die from the compact.
There are specific movements or positions associated with each of these stages. Each stage involves a set of complicated technical problems, and we address them next. We will get into details.

(a).Filling the die

The powder flows by gravity upon falling from the filling device into the die cavity. A hole with a broad cross-section is more accessible to fill with powder than one with a narrow cross-section. According to this definition, thin cross-sections are determined by the size of the most significant powder particles. Powders typically have particle sizes between 0.15 and 0.20 mm. The lateral dimensions of the smallest powder particles of a die cavity must be considerably more significant than the lateral dimensions of the largest powder particles to guarantee unhindered powder flow and good die fill.

(b). Densifying the Powder

Due to friction between the powder and die wall, compacted materials are denser at the ends near the moving consolidating punches than in the center. As the low-density area of a compact becomes apparent to the naked eye, there appears to be a dull region on the shining lateral surface. Generally, the neutral zone is located about halfway between the top and bottom of the compact, which is best for the compact's properties. This is when densification occurs between upper and lower punches that move symmetrically relative to the compacting die. Die movement is symmetrical and stationary, and the upper and lower components move as one lower punch are generated directly by the press. The lower punch is standing. The conditioning of the die and the upper punch is diligently controlled. Ejection occurs by depositing the core rod in the bushing prior to the bushing leaving the die and expanding elastically. There are two advantages to this:

1. There is a much smaller force needed for ejection and, 2. While the bore is open, the pores stay open, which does not occur if the surface is sealed due to the withdrawn high

frictional shearing stress caused by a rod under pressure.

2. compressing machine with sliding support for lower punches was developed. Currently, this tooling principle is on its way out due to its incomprehensible multilevel parts that require high precision and homogeneous density. Nevertheless, it remains a popular alternative for simple two-level parts when modern multifunctional presses are unavailable.

(c). Removing the Compact from the die

During the compacting cycle of a mechanical press without any auxiliary devices, the upper punch exerts the greatest pressure at the lower dead-point. In an instant, the compact moves upward and the lower punches, which expand elastically in axial direction, are freed from axial force. Furthermore, the elasticity of the compact develops at a range of heights which further enhances this effect. These cracks pose a problem for bushings, especially in flanged configurations, because they are difficult to detect and do not heal during the sintering process. Keep away from the compacting segment. The die and lower punches are shifted relative to one another so that the compact is being driven closer. There is no difference between using a stationary die and moving punches or vice versa to achieve this effect. strength to withstand dealing without abrasion or breakage. And they must, if ever feasible, have one sufficiently aircraft face to face on stable on their manner via the sintering furnace. In a few times, it may be acceptable to turn the compacts robotically as they come out of the die before permitting them to slide down a chute or before placing them on a tray.

Compacting Cycle on Presses equipped with Multiple Platen Systems: Complicated sequences of punch actions are required in cases where the compact's shape cannot be duplicated proportionally by using the filling area. If the sort of press lets in it, the best manner to supply a component is through powder transfer: First, the die cavity is crammed up with powder as if the blind hollow turned into at the other stop of the die. Then losing this powder column, without densifying it, downwards to the decrease left of the element. pressure- and stroke-depending movements of die, core rods, and various higher and lower punches should be coordinated efficaciously.

Designing a Compacting Tool: We outline the vital process for designing a compacting device within the following. As a consultant instance, we pick a component having parallel holes and two quantities of various heights. Based totally on the technical drawing of this structural part, a proportionally accurate caricature of the tool is being advanced from which the required capabilities of the various device contributors may be understood. Finally, specific dimensions and tolerances for all tool members are being hooked up. Sooner or later, suitable tool materials and machining- and heat-treating techniques are being considered.

Die : In manufacturing industries, a die is a special device that reduces or forms materials, usually a press. Die makers generally customize their dies to the item being created with them. Products made with dies variety from easy paper clips to complicated pieces used in the advanced era.

Die forming: Device geometry, interference suit, material selection, and stress levels are the principal parameters to be effectively analyzed while designing reduce-outfitted dies for metal powder compaction. Diverse comparisons among analytical and numerical calculations confirmed that the FEM (Finite element method) is the most suitable for organizing the ideal interferences and evaluating the pressure stages at rest. Still, its miles insufficient to assure the most useful life and the minimal unit price per component. Those factors rely on die shape, dimensioning, compaction stress, powder kind, part tolerance, and wear control. When exclusive PM (Powders Metallurgy) producers compete, a "precision" die dimensioning may be the critical element when exclusive PM (Powders Metallurgy) producers compete. Such precise dimensioning must encompass, as a minimum, the increase of inner die dimensions underneath the radial compaction stress, the compact spring-back on ejection, and the allowance

Different types of the conventional machining process: LATHE: A lathe is probably the oldest device tool. Stemming from the early tree lathe, which has become by using a rope handed across the artwork a few instances and connected to a springy department of a tree overhead. The paintings changed into guides thru dowels stuck in adjoining bushes. The operator's foot supported the movement, which became intermittent and fluctuating. The operator holds the device in their hand. A wooden strip called a "lath" was later used to assist the rope. Because of this, the call Lathe. The cutting-edge engine lathe has evolved from this crude starting over centuries. Till about 1770, lathes were vain for metal cutting because they lacked power and preserving machining robust sufficient and correct sufficient to manual the device. For its improvement, the form in which we recognize it now, we owe a good deal to Henry Maudsley, who advanced the Sliding carriage and, in 1800, built a standard screw lathe.

Milling : The milling system is one of the vital machining operations. In this operation, the Workpiece is fed towards a rotating cylindrical tool. The rotating device includes a couple of cutting edges (multipoint cutting tool). Normally axis of rotation of feed is given to the Workpiece. Milling operation is outstanding from distinct machining operations based chiefly on the orientation of the various device axis and the feed route; but, in various Operations like drilling, turning, and so on, the tool is fed in the path parallel to the path an axis of rotation. The lowering tool applied in milling operation is known as a milling cutter, which includes a couple of edges referred to as the teeth. The device that plays the milling operations by producing the desired relative movement among the Workpiece and tool is a milling device. It offers comparable essential training underneath very controlled situations. Those conditions are probably mentioned later in this unit as milling speed, feed, and depth of cut.

Densifying the Powder: Due to friction between the powder and die wall, compacted materials are denser at the ends near the moving consolidating punches than in the center. As the low-density area of a compact becomes apparent to the naked eye, there appears to be a dull region on the shining lateral surface. Generally, the neutral zone is located about halfway between the top and bottom of the compact, which is best for the compact's properties. This is when densification occurs between upper and lower punches that move symmetrically relative to the compacting die. Die movement is symmetrical and stationary, and the upper and lower components move as one lower punch are generated directly by the press. The lower punch is standing. The conditioning of the die and the upper punch is diligently controlled. Die movements are half that of the upper punch during densification. The compact, resting on the stationary lower punch, is ejected from the die when the lower punch moves upward to release it from the die as it is being stripped down. The compacting press must be able to perform each of the three mentioned procedures. In order to operate the floating die, a single downward stroke of an upper ram can be generated mechanically or hydraulically with only two simple tasks required. Compactions with different compacting heights are not covered by this procedure. During densification, the motion of the die is completely controlled by frictional forces, which are highly sensitive to variations in the lubricants in the powder. variations of the die temperature during product, and by progressing wear on the die wall. Today, processes according to combinations of both are being employed for complicated structural parts. Rather than taper too much at the go-out, it is rounded off at the rim to reduce those industries that use CNC machines for different applications such as grinding, plasma cutting, laser cutting, foam cutting, water jet cutting, tube bending, turret presses, punching machines, and electric

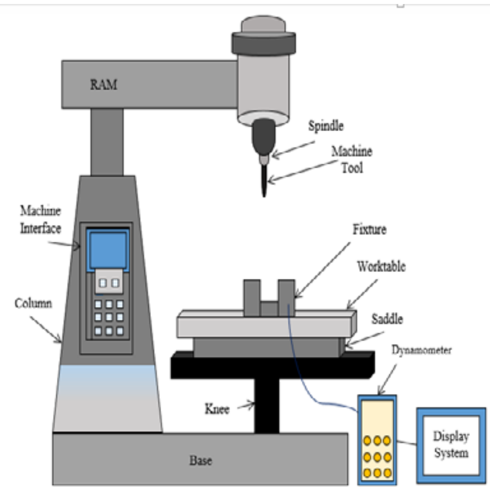


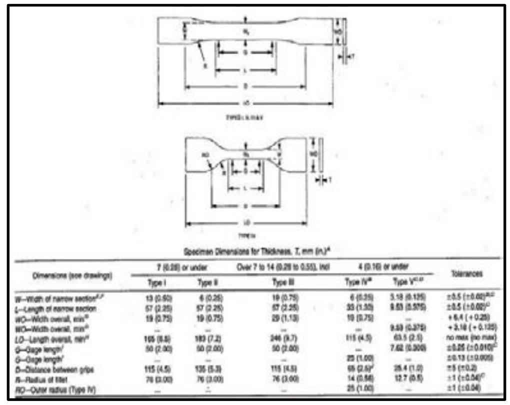
Figure 1. Schematic 3D- Diagram of CNC milling machine

Motion can therefore be resolved in six axes, namely three linear axes, X, Y, and Z, and three corresponding rotational axes, A, B, and C.These machines are very sophisticated and can have multiple cutting tools in a tool magazine.

Different Cutting Tools and problems associated with the machining of HSS alloy: Radially available tools must have the essential characteristics to facilitate the machining of input parameters with the output parameters. So, selecting a proper tool is crucial while machining HSS alloy to improve machining time by cutting down the cycle time. Different tools available for machining stainless steel and its alloys are PVD coated carbide tools, CVD coated carbide tools, tungsten carbide insert, cubic boron nitride (CBN) Cermet tools. The adequately selected cutting tool can reduce the machining cost by 30%. Tool materials are used to face high cutting temperatures while machining to overcome this problem, and tool materials should have hot hardness. Tool material like cermet is used to have superior wear properties and corrosive properties. Tool material should also possess chemical inertness to avoid bonding with the material. Tool material like tungsten carbide is used to have a more significant property like high hardness at an elevated temperature. Many researchers have claimed that it is beyond the hardness of corundum. This tool material must have good thermal conductivity, high compressive and tensile strength, and high toughness. They have so selected tool material, i.e., tungsten carbide used to encompass overall properties, which used to be required for a tool material to turn the workpiece material to achieve the desired results. HSS alloys used to be machined through coated and uncoated carbide tools generally. The researchers for HSS alloys do not recognize ceramic tools. These materials show poor thermal conductivity and excessive wear rate while machining.

The motivation of the current research: Based on the literature, researchers have put a lot of work into understanding the problem associated with the machining of die and punch. A significant amount of work has been done in the machining process behavior, such as parametric influence, analysis of tool failure, cutting forces encountered while machining, and many others.

Methodology and Experimental setup : ASTM standard E8 is used to design tensile test specimen. ASTM standard dimensions are shown in figure 2. Major dimensions of the specimen are overall length, gage length, narrow section, and distance between grips, radius of fillet and outer radius. All the parts are denoted with their symbols.


Specimen Dimensions for Thickness, T, mm (in.)

Dimensions (see drawings)	7 (0.28) or under		Over 7 to 14 (0.28 to 0.55), incl	4 (0.16) or under		Tolerances
	Type I	Type II	Type III	Type IV	Type V	
W—Width of narrow section	13 (0.50)	6 (0.25)	19 (0.75)	6 (0.25)	3.18 (0.125)	±0.5 (±0.02)
L—Length of narrow section	57 (2.25)	57 (2.25)	57 (2.25)	33 (1.30)	9.53 (0.375)	±0.5 (±0.02)
WO—Width overall, min	19 (0.75)	19 (0.75)	29 (1.13)	19 (0.75)	—	+6.4 (+0.25)
WO—Width overall, min	—	—	—	—	9.53 (0.375)	+3.18 (+0.125)
LO—Length overall, min	165 (6.5)	183 (7.2)	246 (9.7)	115 (4.5)	63.5 (2.5)	no max (no max)
G—Gage length	50 (2.00)	50 (2.00)	50 (2.00)	—	7.62 (0.300)	±0.25 (±0.010)
G—Gage length	—	—	—	25 (1.00)	—	±0.13 (±0.005)
D—Distance between grips	115 (4.5)	135 (5.3)	115 (4.5)	65 (2.5)	25.4 (1.0)	±5 (±0.2)
R—Radius of fillet	76 (3.00)	76 (3.00)	76 (3.00)	14 (0.56)	12.7 (0.5)	±1 (±0.04)
RO—Outer radius (Type IV)	—	—	—	25 (1.00)	—	±1 (±0.04)

Figure 2. Dimension values for the tensile specimen as perASTM standard

Autodesk fusion 360 software is used to design and model the punch and die. After designing and modelling, CNC codes are generated from the manufacturing module considering the optimal machine process parameters. All the respected dimensions of die and punch are shown in figure 3 and 4 respectively. All dimensions are in mm.

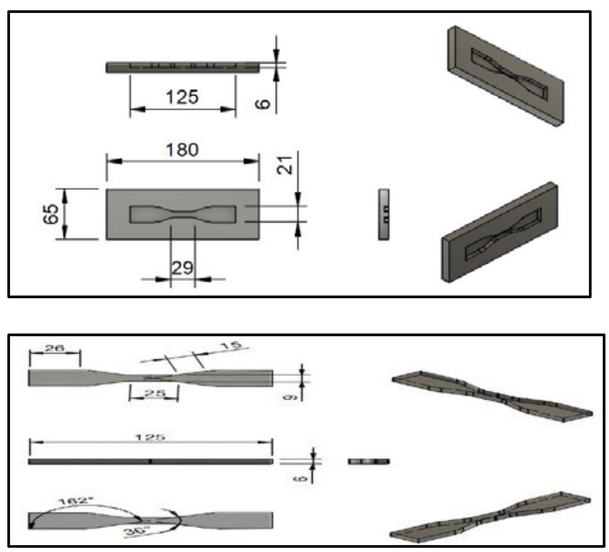


Figure 3. Dimensions of the die as per ASTM standards (All dimensions are in mm)

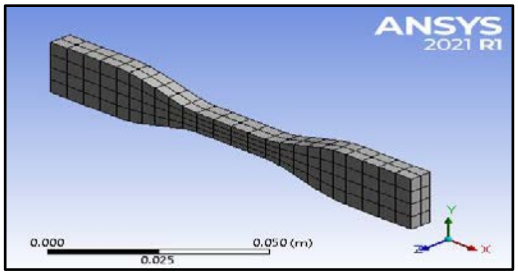


Figure 4. Dimensions of the punch or tensile specimen as per ASTM standards (All dimensions are in mm

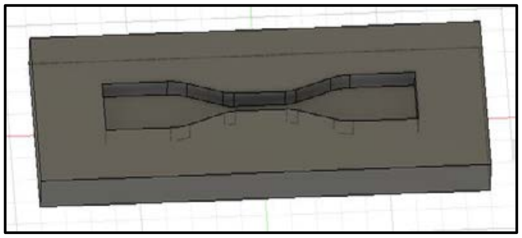


Figure 5. 3D isometric view of the die and punch are shown in figure 5 and 6 re3D isometric view of the die.

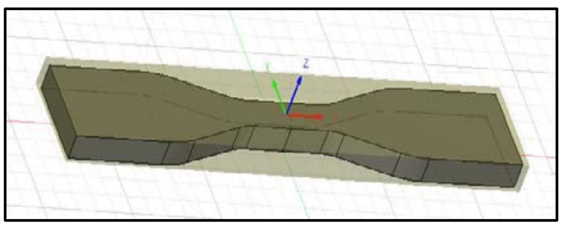


Figure 6. 3D isometric view of the punch or tensile specimen

Ansys workbench 2021 software is used to analyze the punch or the tensile specimen for the maximum stress generation and deflection after applying the required load. Figure 7 shows the 2 D meshed structure of the specimen. Meshed structure is required to analyze the material properties at each node specified in the material library. Figure 8 shows the isometric view. Isometric view helps in the visualization of the sample.

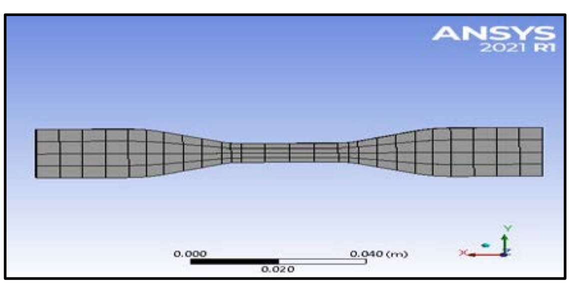


Figure 7. 2D meshed structure of the punch on Ansys workbench

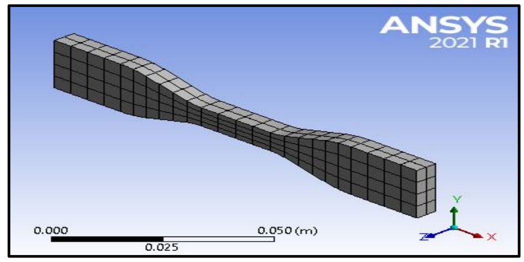


Figure 8. 3D isometric structure of the punch

Static structure of the sample is shown in figure 9 with equivalent von-mises stress generation. Maximum stress is generating at minimum cross section area, i.e. gage neck. The values of the maximum and minimum stress generation are 4.7615 GPa and 0.9270 GPa respectively at neck area and end edge. Specimen is safe up to the applied stress value.

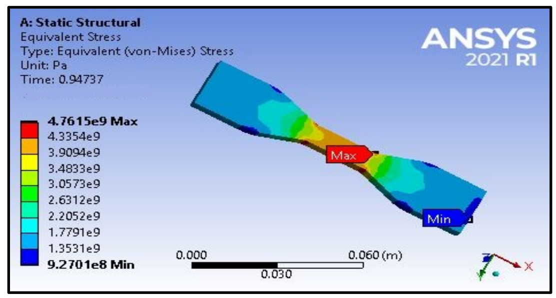


Figure 9. Von-mises stresses on the static structure of tensile test specimen

Strain value reflects the percent change in the length on the application of the load. Figure 10 shows the maximum and minimum strain values of 0.023809 and 0.0046571 at gage neck and bar end position for the static structure of tensile specimen.

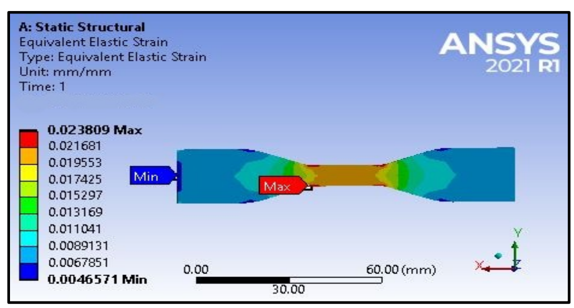


Figure 10. Equivalent elastic strain values for the static structure of tensile specimen

Deflection is the main parameter for the failure of the component. Deflection in the specimen is calculated on the application of the load. Figure 11 shows the maximum deflection of 2.9512 mm at the end edge of the sample. Mild steel is taken for the punch material. The punch will compress the metallic powders in the form of green compact.

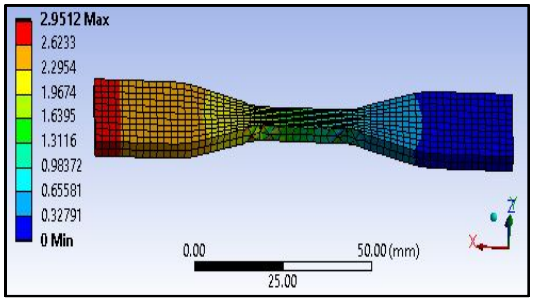


Figure 11. Deflection values in the sample on the application of the load

After finalizing the material properties and machining parameters, die and punch were designed and analyzed using fusion 360 software. Simulation of the machining process was carried out using manufacturing module in the fusion 360 software. Figure 12 shows the slot formation in the die material.

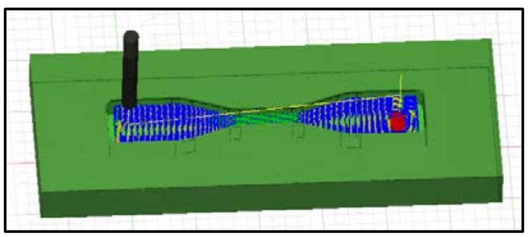


Figure 12. Simulation of the machining process to make a die on fusion 360 software

After simulation of the machining process, a CNC code was generated according to the machine specifications. A CNC vertical milling machine of *Bridgeport INTERACT* Mk 2 maker is used for the manufacturing of the die and punch as shown in figure 13. A CNC code of 1340 steps is generated for the manufacturing of die only and a similar code was generated for punch material. The CNC code is attached in the appendix section.

Aluminium alloy is used as die material and stainless steel is selected as punch material. All the load, stress, strain and deflection analysis are made for the safe condition of the die and punch material. Figure 14 shows the machining of the die on the vertical milling machining. A refined coolant is used to remove the burrs as per the industry standards.

Figure 13. CNC vertical milling machine used for die and punch manufacturing

Figure 14. Visualization of the die manufacturing on the vertical milling machining

The final die is selected after removal of the burrs. All the minor edges were refined so that any hazardious situation can be avoided. Figure 15 shows the final die as per the ASTM standards.

Figure 15. Final die produced after machining

Similarly, the punch was produced considering the optimum machining parameters. Stainless steel material is used to make the punch material.All the minor edges were refined so that any hazardious situation can be avoided. Figure 16 shows the final punch as per the ASTM sta

Figure 16. Final punch produced after machining

Final die and punch assembly is shown in figure 17.

Figure 17. Final die and punch assembly

Results and discussion: Powder metallurgy criteria is used for the sample preparation. Different metal powders were used for the compaction process. Die and punch assembly is designed and manufactured for the compaction of the metal powders. Autodesk fusion 360 software is used to design and model the punch and die. After designing and modelling, CNC codes are generated from the manufacturing module considering the optimal machine process parameters. The following results can be drawn from the thesis:

1. Aluminium is used for die material with dimensions of 180 mm * 65 mm * 10 mm. Total tensile specimen slot dimensions are 125 mm * 21 mm * 6 mm. Neck length of slot is 29 mm. Similarly punch dimensions were selected as per the ASTM standards. Converging angle at the neck is taken as 36^0.
2. Ansys workbench 2021 software is used to analyze the punch or the tensile specimen for the maximum stress generation and deflection after applying the required load.
3. Static structure of the sample is analyzed for von-mises stress generation. Maximum stress is generating at minimum cross section area, i.e. gage neck. The values of the maximum and minimum stress generation are 4.7615 GPa and 0.9270 GPa respectively at neck area and end edge.
4. Strain value reflects the percent change in the length on the application of the load. Tensile specimen shows the maximum and minimum strain values of 0.023809 and 0.0046571 at gage neck and bar end position for the static structure of tensile specimen.
5. Deflection in the specimen is calculated on the application of the load. The maximum deflection of 2.9512 mm observed at the end edge of the sample.

Based on the requirement, different type of materials can be selected for the punch and die assembly. Different type of tensile specimens can also be produced using different punch-die combinations for metal powder compactions. Along with the fusion 360 and ansys, other modelling and simulation softwares like Abacus can also be used for the punch and die modelling and manufacturing. For the compression process, one should use factor of safety as per the material.

Conclusions and Future Scope

Based on the experiments, it may be concluded that the die and punch assembly can be used for the metal powder compression process. Design, modelling and simulation of any die and punch assembly can be successfully implemented using softwares. Combination of the fusion 360 and ansys software is best suited for analysis of any component. The assembly that has been manufactured, can be widely used for compression of any kind of metal powders. ASTM standard E8 is used for the dimensions of the specimens. There is nut-bolt assembly for the engagement of the die. Close tolerances have been taken for the die and punch dimensions. The manufactured die can hold high compression load upto 20 tons. Aluminium is used for die material and mild steel is used for punch material.

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Automated Dual-Purpose Hacksaw Machine

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Abstract:-In any manufacturing industry, increasing productivity is one of the most important goals of production engineering. It is critical for an industry to do this by either reducing operating time or improving the machine's capability to manufacture more components in a shorter amount of time. The Scotch yoke mechanism is used in this project to allow the power hacksaw machine to cut two components at once, increasing productivity.In today's environment, a machine should consume less time. Because the power hacksaw only cut one piece at a time, the output rate was reduced. This time-consuming difficulty is solved with a double acting power hacksaw. The rotating motion is converted to reciprocating motion by the scotch yoke mechanism.

1. Introduction:-

There have been a lot of electrically powered power hacksaw machines available for material cutting of bars that have various parameters. While material cutting is done on a single work piece at a time, these machines are correct, good at cutting materials, and have a low material made uptime with various kinds of materials. The Scotch Yoke is an object that converts the rotational motion of a crank to the linear motion of a slider. There is a sliding yoke with a slot that engages a pin to connect the part that rotates to the reciprocating part. All of the restrictions of standard power hacksaw machines, such material cutting, intervals of time for materials to be processed after cutting, coolant feeding, idle time, and machine efficiency, What is hacksaw? A hacksaw is a saw with very small teeth that is utilized primarily for cutting metal. They can also cut in a variety of various materials, especially wood and plastic. For example, plumbers and electricians commonly employ them to cut plastic conduit and pipe.

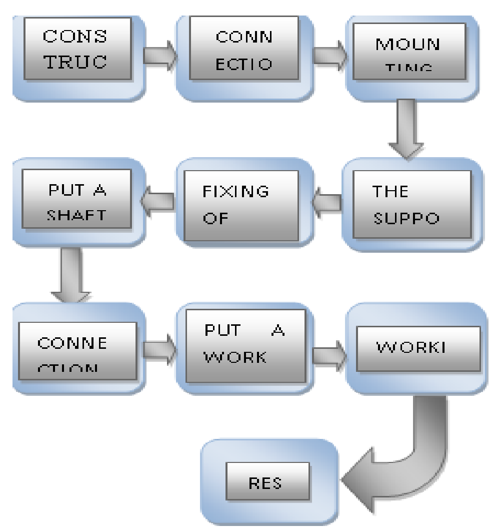
1.1 Hacksaw Types

Power hack sack with a hand saw

Manual saw:- Hand saws, frequently referred to as "panel saws" or "fish saws," are used in carpentry and woodworking to cut wood into different shapes. Usually, this is done for putting the parts together and shapes anything out of wood. Usually, they function by having a number of sharp points created from a material that is more resistant than the wood they are cutting. With one flat, sharp edge, the hand saw resembled a ten on cutter somewhat.

1.2 High power usage:- A tool used to cut though materials like metal and bone is a power hacksaw. There are different types obtainable, spanning heavy-duty, high-production, and utilitarianism makes. These tools are used in most machine shops due to their reciprocating motions, they can cut through material with diameters greater than ten inches. The revolved part of a power hacksaw that cuts material through a backward stroke is called the arm section. The blade has been set in that part of the tool. The tool has a vise to hold the piece requiring to be shredded together.

2. Methodology:-



2.1 Components:-

1.Saw Frame.**2**.D.C Motor**. 3.** Draw Slider.**4.** Bench Vice**.5.** Nut And Bolt**. 6.** Supportig frame**.**

2.2 Saw frames:-Are used for cutting metal or wood, and the blade is held perpendicular to the frame's plane. The material starts to cut through the frame's core.

Figure 1: Saw frames

2.3 Dc Motor:-An electric motor driven by direct current (DC) is commonly referred to as a DC motor. A DC motor generally consists of two main parts: an internal rotor that is connected to the yield shaft and generates a second moving attractive field, and an outside stationary stator with loops supply with replacing current to generate a pivoting attractive field.

Figure 2: Dc Motor.

2.4 Draw Slider:-A slider is an input that allows the user to select a value from an established range. To change the slider's value, a slider's thumb tends to be movable along a bar, rail, or track.

Figure 3 : Slider Draw

2.5 Bench Vice :- A vice is a required and important instrument for working with metal, wood, and various substances in manufacturing. It is used to safely and securely hold work pies.

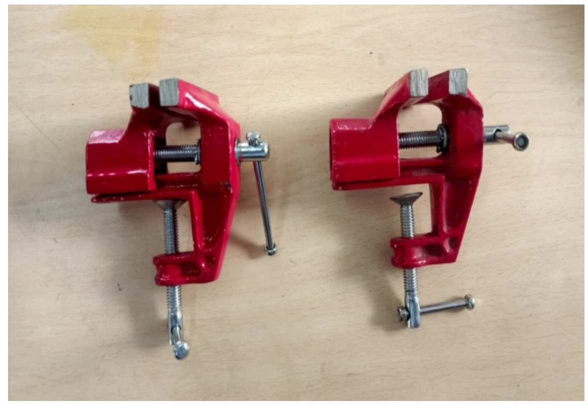


Figure No. 4: Bench Vice

2.6 Nut and bolt :-A fastener is a tool used to hold, assemble, or attach one or more parts. The type of headed and threaded fasteners includes nuts and bolts.

Figure 5: Nut and bolt

2.7 Frame Supporting:-We make use of a square steel frame. All of the parts, include the shaft and DC motor, have been attached to this the base. The middle arm of the frame, which connects to the shaft, balances the motor. All of the moving parts of the automated double hacksaw were held up by the supporting frame.

Figure 6: Frame Supporting

2.8 Working Principle :-We built the automatic hacksaw using a hacksaw and two pairs of scotch yoke mechanisms. Using two hacksaw blades, this kind of saw may continuously cut two work pieces in a specific amount of cycles. As a result, by saving time when stopping and restarting the process, it will help to improve output.

Figure 7: Working Principle

2.9 Start results with conversation: -Electric engine operating at 32 rpm drives the machine. The wooden example was run on a machine. On the stacked test, an ordinary steel pole of six inches in height was fixed onto the machine's poor habit. The machine required 240 seconds to cut the material using another hacksaw cutting edge. It was noticed that the slice was straight and excellent.

Figure 8: Automated Dual-Purpose Hacksaw Machine

3.Conclusion: -It is being shown that a programmable dual hacksaw machine may substitute an ordinary hacksaw machine. When compared to standard hacksaw machines, the programmed dual hacksaw machine produces outstanding productivity in a brief period of time. The machine's true benefit is that it minimizes work interference to its greatest extent achievable. Modern swiftly changing industry makes a great deal of multiple hacksaw machines. The use of these kinds of configurable machines could consume the time and labour that go into a procedure. The programmed hacksaw machine can be utilized in any type of company operations, include the manufacturing of furniture.

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A Research Paper on Electricity Generation From Solar Energy

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Abstract
The Solar Energy is produced by the Sunlight is a non-vanishing renewable source of energy which is free from eco-friendly. Every hour enough sunlight energy reaches the earth to meet the world's energy demand for a whole year. In today's generation we needed Electricity every hour. This Solar Energy is generated by as per applications like industrial, commercial, and residential. It can easily energy drawn from direct sunlight. So it is very efficiency & free environment pollution for surrounding. In this article, we have reviewed about the Solar Energy from Sunlight and discussed about their future trends and aspects. The article also tries to discussed working, solar panel types; emphasize the various applications and methods to promote the benefits of solar energy.

1. Introduction

Nowadays, due to the decreasing amount of renewable energy resources, the last ten years become more important for per watt cost of solar energy device. It is definitely set to become economical in the coming years and growing as better technology in terms of both cost and applications. Everyday earth receives sunlight above (1366W approx.) This is an unlimited source of energy which is available at no cost. The major benefit of solar energy over other conventional power generators is that the sunlight can be directly converted into solar energy with the use of smallest photovoltaic (PV) solar cells. There have been a large amount of research activities to combine the Sun's energy process by developing solar cells /panels/module with high converting form. the most advantages of solar energy is that it is free reachable to common people and available in large quantities of supply compared to that of the price of various fossil fuels and oils in the past ten years. Moreover, solar energy requires considerably lower manpower expenses over conventional energy production technology.

Solar Energy:

Amount of energy in the form of heat and radiations called solar energy. Shown in Figure 1. It is radiant light and heat from sun that is natural source of energy using a range of ever changing and developing of technology such as solar thermal energy, solar architecture, solar heating, molten salt power plant and artificial photosynthesis. The large magnitude of solar power available makes highly appealing source of electricity. 30% (approx.) solar radiation is back to space while the rest is absorbed by ocean, clouds and land masses.

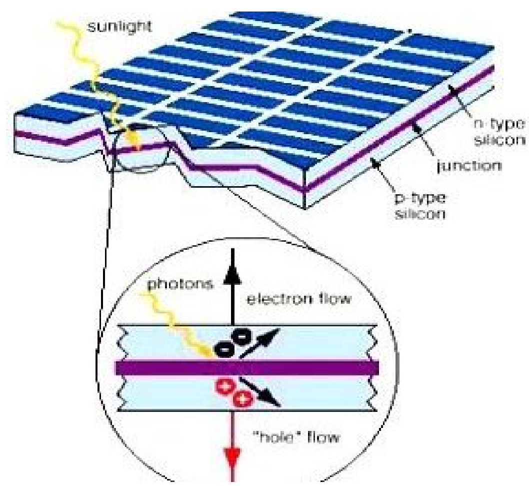

Figure1. : Internal of reaction of solar energy

Working of solar energy : PV cells Convert Sunlight to Direct Current (DC) electricity. Charge Controller work as control the power from solar panel which reverse back to solar panel get cause of panel damage. Battery System act as storage of electric power is used when sunlight not available (i.e. night) From this system connected to inverter for convert Direct Current (DC) into Alternating Current (AC).

Figure 2: Working of solar energy

Modeling of pv panel

Solar cell *(Photo voltaic cell)*

The cells converted solar radiation directly into electricity. It consist various kinds of semiconductor materials. It has two types: positive charge and negative charge shown on Figure.1. This cell technology are used to design solar cells with low cost as well as high conversion efficiency. When the cell absorbed photons from sunlight, electrons are knocked free from silicon atoms and are drawn off by a grid of metal conductors, pressure a flow of electric direct current. Solar cell PV made up of many chemicals.

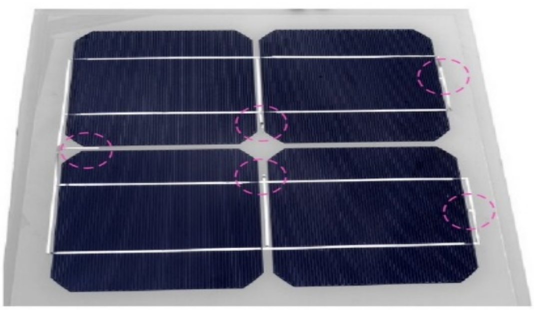

Figure 3: Photo voltaic cell (4 cell)

Photo voltaic module

A PV module consists of solar cell circuits sealed in an environmentally protective laminate and are the fundament building blocks of PV system. Generallysizes from 60W to 170W. Usually a number of PV modules are arranged in series and parallel to meet the energy requirement.

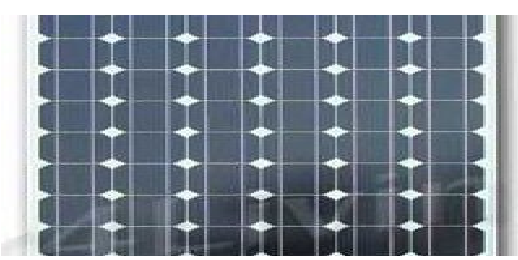

Figure 4: Photo voltaic module (Multiple Cell)

Photo Voltaic Panel

It includes one or more PV modules assembled as a pre-wind, field instable unit. In this panel PV cell is series connections. Solar panels are made up of individual PV cells connected together.

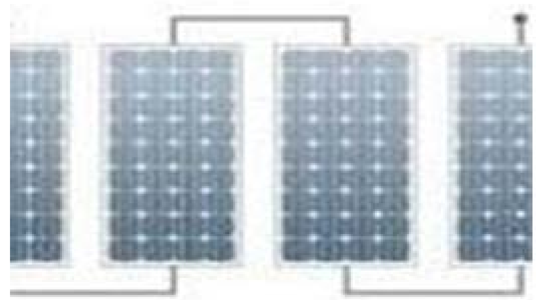

Figure 5: Photo Voltaic Panel

Photo Voltaic Array

It is contain of several amount of PV cells in series and parallel connections. Series connections are responsible for increasing the voltage of the module whereas the parallel connection is responsible for increasing the current in the array. It generates maximum 180W in full sunshine. Large the total surface area of the area of the array, more solar electricity it will produce.

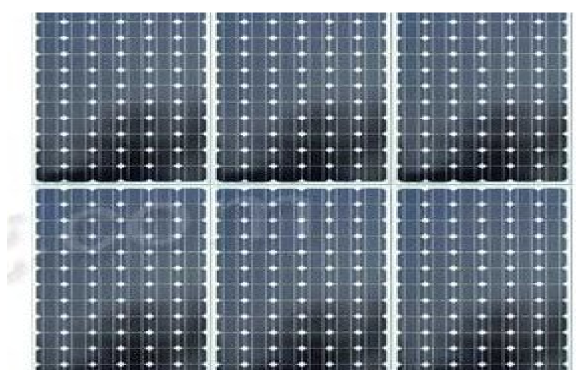

Figure 6: Photo Voltaic Array Multiple Modules

Solar concrete collector: Parabolic Through Reflectors: It contain of linear parabolic reflector concentrates light onto a receiver positioned along the reflector's focal line. It consists of receiver is a tube positioned directly above the middle of the parabolic mirror and fluid with a working fluid. A working fluid is heated 150-350 Cas it flows though the receiver is then used as heat source for a power generation system.

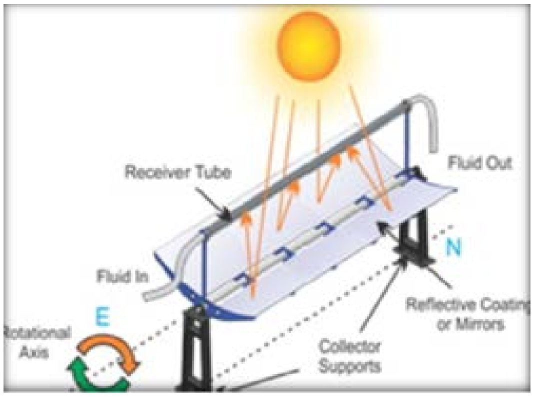

Figure 7: Paraholic Trough Redlectors

Fresnel

In a Fresnel lens, the refraction happens to produce in the surface, while the large material between the two surfaces doesn't have any problems in the refraction. It will use raise more temperature than conventional one and also used in furnace heating. It installation has been used for surface modifications of metallic materials. This equipment is applying solar energy in the field of high and very high temperatures. These temperatures are achieved in a few seconds. Fresnel concentrator performed 34.3% reduction in reflective area compared to a parabolic of the same diameter, the 20 minutes series of action performance needed for manual adjustment in order to track the sun proved to be a major disadvantage with this device.

Figure 8: Fresnel Reflector

Parabolic Dish

It similar in appearance to a large satellite dishes, but has mirror like reflectors and absorber the focal point. It used a dual axial sun tracking. It is efficiency of 30% achieved. By this dish it produces in MW level in solar plant. This is highest conversion performance of the concentrating solar power technology.

Figure 9 : Parabolic Dish

Merits Of Solar Energy :

Sustainable and Renewable: Solar energy comes from the sun, an endless supply of energy. We may use the sun's energy as long as it is present.
Environmentally friendly : The production of solar power helps to prevent climate change and minimize air pollution because it emits no greenhouse gases or other pollutants.
Minimal Operating Costs: Compared to other energy generation methods, solar panels have relatively little operating costs once they are installed. There are no fuel expenses, and little maintenance is needed. Energy independence is attained by using solar energy instead of fossil fuels, which are frequently imported, volatile in price, and the subject of geopolitical unrest.
Versatility: Solar energy has a wide range of uses, from powering individual homes and devices to producing electricity in large-scale power plants.

Demerits of Solar Energy :

Challenges with Energy Storage: The process of storing solar energy for usage in the absence of sunlight can be expensive and technically difficult. Although they are not yet extensively used on a big basis, batteries and other storage technologies are advancing.
Land Use: The substantial land area needed for large-scale solar power plants can result in conflicts between competing land uses, particularly in places with high population densities.
Costs Up Front: Installing solar panels can need a substantial initial expenditure, despite the low running costs of solar energy.

Conclusion

The majority of individuals are aware of non-renewable energy sources. Because solar energy offers financial advantages, it has grown in popularity. Even on overcast days and at night, solar energy may produce electricity using a battery backup. This is also utilized with continuously powered inter-grid systems. When compared to other energy sources like fossil fuels and petroleum resources, it offers more advantages. It is a reliable alternative that can keep up with the increasing demand for electricity. There is hope for the future of solar cell and solar energy research worldwide.

Acknowledgement

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Golden Rice: A Miracle Transgenic Crop and a Good Example of Bio fortification

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Abstract:
This is a review article in which we discuss Golden Rice, a variety of rice (Oryzasativa) produced through genetic engineering to biosynthesize beta carotene, a precursor of vitamin A, in the edible parts of the rice. It is intended to produce fortified food to be grown and consumed in areas with a shortage of dietary vitamin A. Vitamin A deficiency causes xerophthalmia, a range of eye conditions from 'night blindness' to more severe clinical outcomes such as 'keratomalacia' and corneal scars. Although Golden Rice has faced significant opposition from environmental and anti-globalization activists, more than 100 Nobel laureates in 2016 encouraged the use of genetically modified 'Golden Rice'.

1. Introduction :

The research for the development of Golden Rice began as a Rockefeller Foundation initiative in 1982. In the 1990s, Peter Bramley discovered that a single phytoene desaturase gene (bacterial crtl) can be used to produce lycopene from phytoene in GM tomato. Rather than having to introduce multiple carotene desaturases that are normally used by higher plants, lycopene is then cyclized to beta carotene by the endogenous cyclase in Golden Rice. The scientific details of the rice were first published in 2000. The first field trials of Golden Rice cultivars were conducted by Louisiana State University. As of 2018, breeders at the Philippine Rice Research Institute, the Bangladesh Research Institute, and the Indonesian Centre for Rice Research have also been involved in the research and development process.

2. Benefits of Golden rice

The benefits of Golden Rice are numerous and significant. They are as follows: Golden Rice provides a higher quantity of vitamin A. It allows for easy distribution when released to areas in need. It offers a cheaper option to supply the vitamin A requirement compared to other supplementary measures. Vitamin A is an essential micronutrient for the growth and development of human beings, as well as for maintaining a healthy visual and immune system. We believe it should be broadly approved and given the opportunity to save and improve lives. Golden Rice is a new type of rice that contains beta carotene. It offers hope for sustainable improvement to a long-recognized issue. Golden Rice needs to be consumed regularly by affected populations. Rice, grown by farmers and offered for sale, is purchased by families, especially those living away from agricultural centers. Rice feeds half the world daily, providing more than 60% to 80% of daily calories in many countries. Rice could improve the vitamin A status of deficient food consumers. We believe Golden Rice is an enhanced version of ordinary rice designed to address a specific nutritional issue without any additional cost or difference in taste. Developed through genetic engineering, Golden Rice contains beta carotene, which is not naturally found in the grain. Scientists used specific genetic engineering techniques to add the compound to the grain, a minor tweak that significantly improves its nutritive value.

3. Challenges

There are several challenges for growing Golden Rice. These include: Risks of potential allergies and antibiotic resistance. The possibility of genetically modified foods entering the food supply when GMO crops are planted near non-GMO crops without consumers' knowledge.

Contamination of other rice varieties and wild relatives of rice fields. Rice field trials conducted so far have only focused on the agronomic traits of Golden Rice. Its long-term effects on the environment, including possible impacts on the genetic diversity of the thousands of rice varieties growing in the fields. The GDP boost from Golden Rice technology potentially making developing Asia more affluent. The risks associated with Golden Rice, including potential allergies or antibiotic resistance. Golden Rice could not grow without the farmers' knowledge. So, this is all about the impacts of Golden Rice, which are showing on the environment and other plants.

Acknowledgement

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Figure 1: Picture showing Normal Rice and Golden Rice

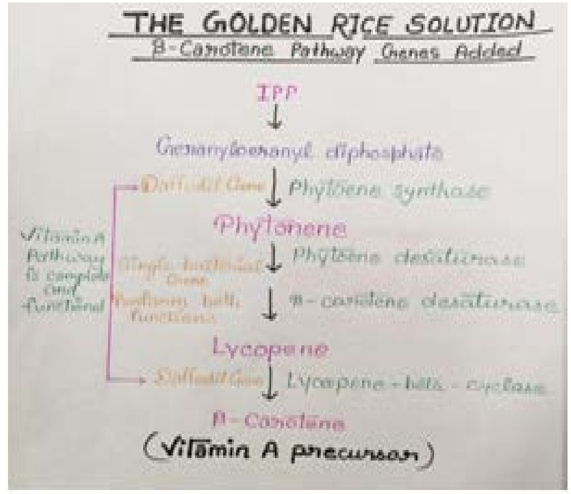

Figure 2: Diagram showing Vitamine A formation in Golden Rice.