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3D PRINTING AND IT'S APPLICATIONS IN MECHANICAL INDUSTRIES - A REVIEW

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Abstract
The abstract for this research paper provides an overview of the transformative technology of 3D printing and its diverse applications. As a revolutionary manufacturing method, 3D printing has developed and a game-changer in numerous industries, from healthcare to aerospace, bringing innovation and effectiveness to traditional manufacturing processes. These abstract places of interest the various materials and techniques applied in 3D printing, emphasizing it's possible to shape a maintainable and customizable future., and also discusses the challenges faced in scaling up 3D printing for mass production while showcasing the immense potential for democratizing industrial and authorizing individuals with imaginative freedom. Moreover, it addresses the impact of 3D printing on the design process, supply chain management, and the reduction of waste through on-demand production. By exploring the current limitations and future prospects of 3D printing, these abstract aims to inspire further research and development in this transformative technology and the manufacturing of daily usage materials and with low cost and high strength materials. In this paper mainly talks aboutthe various applications and methods that are used in the 3D printing technology.

Keywords: 3D Model, CAD, Layer Thickness, Printer Bed , SDL, SLA, SLS, 3D Printer.

I. Introduction

3D Printing is also known as additive manufacturing, has emerged as a transformativetechnology that is revolutionizing the way we create, design, and manufacture objects.3D Printing is a process where a digital model created using computer aided software (CAD) is turned into a physical three-dimensional object by adding material layer by layer. Using 3DPrinters, engineers or designers can build prototypes layer by layer using various materials, including plastics, metals, and ceramics. It eliminates the need for molds or tooling and allows for faster iteration and testing of designs. In recent years, 3D printing has developed significantly and can now perform crucial roles in many applications, with the most commonapplications being manufacturing, medicine, custom art, and design. By using 3D printing we save time on assembly process and the material wastage is less. Mechanical 3D printing enables the production of a batch of parts that are traditionally made of many components. 3D printers are readily available in the market and many printing services. 3D printing is to create new business models and opportunities with the technology. The role of 3D Printing in modern society has evolved significantly since its inception, and its potential applications are seemingly boundless. From rapid prototyping and custom manufacturing to medical advancements and architectural innovation, this cutting-edge technology has opened up new avenues for creativity, efficiency, and problem-solving. Moreover, 3D printing has emerged as a game-changer in the realm of custom manufacturing.This technology allows for on –demand production of highly personalized and tailored products, catering to individual preferences and needs. For consumer goods and fashion items to dental prosthetics and medical implants, 3D printing empowers manufactures to create unique solutions that were once considered unfeasible with conventional manufacturing approaches. Another lesser-known advantage is the flexibility of the design. With injection molding there are a lot of limitations as to what kind of plan you can make. By 3D printing, belongings are much extra supple. There are certainly some dos and don'ts, which we will go over later. But overall, you can 3D print basically any shape that you can visualize. The main caution is that you're going to have a lot more work to remove supports afterwards,

if the design is not properly optimized for 3D printing. Physical supports are required for any areas of the design with an overhang area so they don't collapse during the printing procedure. But overall, it is a very flexible technology that allows you to take almost anything you can imagine and make it into reality. The procedure works by placing down thin layers of physical in the form of liquid or powdered plastic, metal or cement, and then fusing the layers organized.

II. Literature

The literature review is given for the forty journals. The 3D printing applications and the uses in medical and daily usages. We studied the forty journals are mentioned below as follows:

A.D. Meadowcroft et al. [1] In this paper the authors mentioned about the issue for the microtubular solid oxide fuel cell (mSOFC) and it is the complex inlet manifold for the fuelentry. It shows about the rapid prototyping of fuel inlet manifolds. The major benefit of the method is the ease of prototyping, ease in printing complicated designs and imagining of the concepts. In this paper, a design for mSOFC manifolds has been evolved,fabricated by 3D printing and tested in a 64 tube mSOFC stack. The results show that there are benefits of low mass, ease of gathering and improved financial side. ceramic fuel cell tube with a warm-up region as the tube goes into the hot-box at with an internal Partial Oxidation (POX) Catalyst at the hot entry to process hydrocarbon fuel with a premixed air formulation. The 3D printer mathematically slices the records and begins building the toolpath. The deposition of the ABS material begins with a process called FDM (Fused deposition Method). Microtubular solid oxide fuel cells have had a significant difficulty of feeding inletfuel gas to hundreds or even thousands of fuel cell tubes d with disadvantages of excessive bulk,assemblage problems and high costs.

Qiliangzhang et al. [2] The paper aims that the work of bone tissues and medical purposes. Bone has a strong ability to repair itself, it cannot completely repair large-volume bone defects. Bone transplantation and non-natural bone transplantation are likely to endangered rejection in the methods. The process of preparing the bone scaffold is given as first, the three-dimensional data of the repair site is added by CT scan or magnetic resonance imagination, and then the three-dimensional model is "sliced" with CAD software Finally, the device prepares the bone scaffold by stacking the materials layer by layer according to the layered data. +The raw materials used in the fusion heat-shrinkable polymers, including polyamide, polyester, polycarbonate, polyethylene, polypropylene. Materials that are used inthe printing are Metallic material, Non-metallic materials, Bio ceramics, Polymer material, Composite materials. The paper concludes that the 3D printing technology can manufacturebone scaffolds with complex structures. The prepared bone scaffolds are similar to the humanoid figure in terms of exterior morphology and microstructure.

Jean Henri Odendaal et al. [3] In this paper the authors clarified about the Steerable needles are frequently used in surgical operations and approach in the treatment of certain diseases. The key advantage of this being that the needle tip can work its way through a body,avoiding all sensitive areas and obstacles, and ultimately reach an otherwise unreachable area. This article presents the engineering and software requirements to control a steerable needle with careful definition for 3D printing. To achieve the statement of our sodium alginatesolution, we designed a custom steerable needle test bed which consists of motors, a syringepump, a needle sheath for stability, stereo cameras to observe the needle associated with a computer vision system, and a platform. The resulting fibers and the suitability of steerable needles in depositing a polymer and hence acting as a 3D printing technique. 3D printing setup holds much potential especially when the challenges associated with the interface of biopolymers and the human body can be overcome and seeks to play a part in the future in vivo manufacture of structures such as muscle, nerves, bone, etc.

Bin Wang et al. [4] The paper describes about the 3D printing of the meniscal tissue by using the high concentration extracellular matrix inks. The meniscal tissue is which that are in the human body at hand bones and joints and in the knees. Decellularized extracellular matrix (dECM) has appeared as a

promising biomaterial in the fields of tissue engineering and regenerative medicine due to its capability to provide specific biochemical and biophysicalcues kind of the regeneration of diverse tissue type. meniscal tissue, the potential of 3D printing of highly focused meniscus dECM inks to produce mechanically functional andbiocompatible implants for meniscal tissue regeneration. The tissue made by the Synthetic polymers such as polycaprolactone (PCL). The results of the paper are which can print the tissues by the protocols generated high concentration dECM inks that display shear withdrawingand thixotropic belongings that makes them ideally suited to 3D printing applications.

Thomas W. Schmidt et al. [5] The paper describes about the 3D printing of the foot wear manufacturing on textile surfaces by the digital 3D Printing. Generally, now a days HAPTIC coating in a fully automatically controlled new 3D printing process. This paper will further discuss the developed process required to bridge the gap between dispensing the aquatic HAPTIC ink on flat to rounded materials. This new application method was discovered in this work using a robot assistant- and 5-axis controlled dispensing. Two different PET-basedfabrics were chosen to optimize the dispensing of textiles. A flat PET-based mesh shoe upperfabric served as a substrate for dispensing 3D structures and subsequently evaluating the adhesion and bonding of the HAPTIC inks onto the substrate as shown in the paper. Moreover, the results of the journal paper are t is observed that in the case of the higher viscosity ink (HAPTIC-3), the serious extrusion rate needs to be at least 6 mm/ s to obtain a homogenous statement line, whereas for the middle viscosity ink (HAPTIC-2) and low viscose rayon ink (HAPTIC- 1) require an extrusion rate of 4 mm/s and 2 mm/s.

Mehmet Sakin et al. [6] This paper describes about the latest technology of 3D printing ofbuildings for sustainable houses. 3D printing building technology is a new construction technique started with the invention of 3D printer. The 3D printing in construction industry is obtainable Stupino town, Moscow, Russia - Apis Cor first company to develop a mobile construction 3D printer) and the integration of BIM method with 3D printing modeling will be effective for energy efficiency, better design, cost reduction and isolation of structure. plan eventually solid labour costs by 50 % to 80% and building excess by 30% to 60%. Russian company has done just, with a 400-square-foot-home being built from scrape in just 24 hours in Moscow. The materials use are ‘meta-materials’, known formulae that syndicate numerous polymers in different ways to produce. The conclusion of the paper was 3D production system and we realize that BIM is also one of the synchronizing equipment for 3D print system and foe future plan and calculation of the building.

DO Kyeong Lee et al. [7] This journal paper describes about the fabrication of 3D structureby the inkjet printing process. This study demonstrated the inkjet 3D printing to manufacture multi-layer composite structures using photocurable SiO2 ink and intense pulsed light (IPL)sinterable conductive Cu ink and the materials that are fabricated to study the applicability of inkjet 3D printing in the electronics. The methods used in the printing and it, including selective laser sintering (SLS), fused deposition modeling (FDM), stereo lithography apparatus (SLA), inkjet, and binder jetting (BJ). To apply the inkjet printing style to 3D printing. Ethanol was used to clean the ink inside the printer head. Thermal, electrical, and mechanical properties of HDDA-SiO2 filler composite were characterized after curing by UV lamp. To form a conductive layer using inkjet printing, properties of IPL sinterable Cu ink. The conclusion of the paper was 3D printing of a multi-layered composite structure composed of insulative layer and conductive layer was studied using inkjet 3D printing.

Thabiso Peter Mpofu et al. [8] 3-D printing is also known as Additive manufacturing technology had been playing important role in the process of making a three-dimensional solid object of Virtually any shape from a digital model. 3D printing is done layer by layer using plastic , nylon, metal and other materials. 3D printing is useful in the construction, dental and medical industries, education, manufacturing, engineering, marine engineering and with many others. 3D printing is a process of making a three-dimensional object of virtually any shape from a digital mode. 3D printing has also had a tremendous usage in thefield of medicine., from the field of Bionics, to Prosthetics to Digital Dentistry. They are usedin Domestic usage products like necklaces and rings. Small plastic toys can also be printed in a domestic setting. Clothing like Fashion designers are experimenting with 3D

printed bikinis, shoes and dresses and the production was done on a commercial scale. The result isa 3D scanner can be used for an existing object., which will see printer creating the object layer by layer which can easily make the printing objects by these methods.
Hualin Dong et al. [9] The paper defined about the challenges of the 3D printing based onmeat materials. Now a days the meat materials are driving great progress in the food industryand the 3D printing plays a major role in the industries. the application of 3D printing in meatstill faces many challenges. The development of cultured meat, the full application of by- products, and the emergence of new technologies provides opportunities for the application of 3D printing in the meat industry. Extrusion 3D printing is the most suitable technology forfood materials. Meat by-products mainly include body parts other than muscle, such as offal,casing, feet, and fat, secretarial for 52% and 66% of the live weight of cattle and pigs. The conclusion is given as follows meat materials are non-native printable materials, which needto be pretreated or formulated to improve printing characteristics. Pre-treatment technology provides the feasibility of direct printing of "additive-free" raw materials, and grafting pre- treatment technology (e.g., ultrasound, infrared) onto 3D printer.
Shruti Ganesh Sarvankar et al. [10] This journal paper aims about Automotive industry faces new challenges every day, new design trends and technological deployments Therefore,new tools or tool reshaping for new components is required. A significant parameter of usingmetal AM procedures in the automotive sector is fabricating complex lightweight. The weight of the locomotive parts can be reduced significantly by using the ability of AM processes to supreme advantage to produce parts with complex geometries while maintainingrelative strengths. Some parts produced using AM technologies occasionally have tiny voidsor pores that can weaken overall strength. In others, dimensional accuracy is not always on par with parts made with conventional manufacturing processes. These and other quality issues can diminish product uniformity and consistency, a challenge for high-volume industries.
Waleed Ahmed et al. [11] The journal paper describes about the using of the 3D printing in innovative manufacturing in the industries and aims to present the challenges and the achievements of integrating 3D printing technology in teaching design and manufacturing courses. The innovation in the addressed solution revealed the importance of 3D printing technology to enhance the students' skill and engagement with the course material and helpthem to encounter challenges to come up with accurate solutions with desired shapes and printed materials. The technical drawing, engineering graphics, and computer aided design (CAD) at various levels of different programs. One of the educational applications where 3Dprinting technology has been implemented in mechanical engineering courses to highlightthe contribution to integrating 3D printing technology.
Yifan sun et al. [12] This paper describes about the applications of 3D printing in sensors that are used in the monitoring of the water quality. The development of sensors for water quality monitoring is crucial to protect water quality, aquatic biota and human health. cell, sensing electrode as well as all-3D-printed sensors. 3D printing technology used in water sensor development and benefit the protection of water resources. such as the polyjet, the direct metal laser sintering (DMLS) and the digital light synthesis (DLS). Clearly, the development and the relevant applications of 3D printing technology are used. The conclusion is given as the development antiquity and market share of typical 3Dprinting technologies and their applications in sensor development for water monitoring and analysis.These methods could be costly, hard to use, limited in geometry and very unfriendly for prototype production in small quantities, which has restricted sensors research.
A.S. Elakkad et al. [13**]** The journal paper describes about the 3D Technology in the Motorized Industry The focus of this project is on the improvement of the manufacturing technology process by use of 3D printing software in the automobile industry. the automotiveindustry in knowledge how 3D printing technology can be utilized in the creation of high- quality vehicles at reduced costs. The targeted at manufacturers of automobile parts at the Ford Motors, Toyota, Kia, Volkswagen, Bugatti, Mercedes, and Honda Motor corporations.The responses made from the seven respondents from the seven-automobile manufacturing companies were expressed as a percentage. As such, all car

manufacturers should strive to adopt and incorporate. Through the use of 3D technology, certain parts of vehicles such as the lamps, mirror holders, and dashboard components, among others, can be created with ease.

Jose Jean-Paul et al. [14] The paper defined about the design and implementation of 3D printer and the technology was come up in the covid-19 pandemic. the objective to present the design and implementation of a 3D printer. the developed project involving mechanic andelectric project, project cost, programming and slicer, calibration, printing parameters, and will also expose de results through application of the project, 3D printing tests, and also the certification with all design parts, codes and printing parameters. Acrylonitrile Butadiene Styrene (ABS), Polylactic Acid (PLA), Polyethylene Terephthalate Glycol (PETG), carbon fiber and nylon are the materials used in the process. However, this time the laser will sintering together powder particles in the shape of the cross-section by heating and the building platform will go down for recover with other layer of powder. To solve this problemall holes which cannot have an interference fit where increased in 0.25 mm.

Nayem Hosian et al. [15] This journal paper describes about the applications of 3D printedobjects. 3D printing is a popular nonconventional manufacturing technique used to print 3D objects by using conventional and nonconventional materials. The metals used in medical applications are typically titanium, titanium oxide, stainless steel, titanium nitride, zirconiumoxide, carbon nitride, and cobalt chromium alloys. Applications of 3D printing in medical, industrial, automotive, construction, architecture, electronics, aerospace, and decorative sectors are abundant. ABS (acrylonitrile butadiene styrene) is used in 3D printing for mechanical and electrical works. Moreover, the conclusion of the journal paper is has showndramatic development in recent years of using smart materials popularly known as 4D printing with conventional other materials. Incorporating nanomaterials to give strength and achieve desired mechanical properties.

Dina R. Howeidy et al. [16] This paper intentions to emphasis on dissimilar assistances and values of employing the 3dimensional printing technology in the discipline of Architecture and Interior Design for undergraduate learners and examine the final results. It also aims to present the rewards and the disadvantage of adding this technology to the architectural educational process for undergraduates, to help them having specialized models for their projects. The study used a special procedure, which concentrated on the importanceof the 3D printing. The model that was done in 3dx Max had to be converted from CAD files to STL format in order to achieve the highest levels of evenness when printing the model in three magnitudes. The challenges are given as Decrease the time and expense required for a specialized detailed architectural model and produce professional presentation of model's design and quickly respond to any changes in. The conclusion as shown in paper are results to be proved regarding the importance and usefulness of applying the new technology in the higher education especially in the field of Architecture and Interior Design. the benefits and values of the technology of 3D printing in Architecture and Interior Design are shown.

T Ganesh et al. [17] This paper intentions to emphasis on direct impact on manufacturing the composite structures and in particularly fabrication of Molds. Automated fiber placement(AFP) slog cells. In this process, the printing material will be added layer by layer. A Fused Deposition Modelling (FDM) head is described on, attached to an industrial robot A hybrid 5-axis CNC engine involving 3D printing and subsequent milling for better-quality dimensional precision has been developed by Lee brilliant of multi plane 3D printing due to its rotational construction platform. SLS uses a high-powered C02 laser to fuse small particlesof powdered material to create 3 dimensional parts. The results are given as enterprise and study of 3D printing machine and perfectly executed program in 3D machine using fabrication of Robot devices successfully. The conclusion of the journal paper was e design of the surround is made healthy and compact using aluminum sections. The solid selection of the various essentials is economical.

Salah Amroune et al. [18] This journal paper labels about the manufacturing of the quickprototypes and for mechanical parts and design & production of powered parts that havecomplex shapes using the technique of reverse plan using a scanner or an MMT for data accomplishment in the form of a point

cloud, using CAD software (CATIA). It is a development used for the creation of 3D objects whose layers are formed under the control of a computer to create an object. The printer used in this work is of category "Any cubic i3 mega" with a resolution which varies between (0.05-0.3 mm) and a printing speed of 60 mm/S. The shapeof the gas turbine edge model is generated using the CATIAV5R20 software program. Package whichgives us an STL file from a digital file. Parametric CAD models contains design intent, a structured combination of 3D prismatic functions driven by specific sizes. Productiontime and costs are reduced. The design and industrial defect can be easily identified andAble to produce parts and theoretical models.

Arpine Galstyan et al. [19] This journal paper describes the three-dimensional (3D) printing is amethod by which two-dimensional (2D) virtual data is converted to 3D objects by depositing various raw materials into successive layers. While there are multiple review articles describing utilization of 3D printing in various disciplines. There is paucity of literature addressing applications of3D printing in breast cancer management. Here in, we review the current applications of 3D printing in breast cancer management and discuss the potential impact on future practices. The application of 3D printing is becoming increasingly adopted in training and simulation of complex surgical and image guided procedures. 3Dprinting is poised to revolutionize breast cancer surgery by allowing patient-specific pre- surgical guides for breast conservation and reconstruction. The enhanced understanding of anatomic relationships rendered by 3D models has allowed better esthetic surgical outcomes while simultaneously achieving negative surgical margins. 3D printed phantoms are providingto be superior to traditional phantoms that are used for quality assurance of breast imaging systems. Bioprinting and personalized radiation therapy are emerging fields which are promising to address challenges encounteredwith current breast cancer management approaches.

N. Nachal et al. [20] This journal paper describes about the 3D printing is an excellent innovation in food formulation and in manufacturing process Preparing foods with customized sensory attributes from different ingredients and additives has always been a need. In recent years, with advancements in robotics, 3D printing has gained importance, finding many applications in different industrial sectors and embedded letters/logos in cookies using ink-jet sprays. With digital controls, it is likely to fabricate 3D structures layer-by-layer using 3D printing. Printing foods allows users to design and fabricate foods with modified figures, color, flavor, and tailored nutritious needs3D printing of foods follows a well-defined sequential process. G-codes refer to the numerical control language generated by the CAD software to guide motors about printing region, printing speed, and production axis. The conclusion of the paper was that the 3D printing is used for the food processing.

Helena Dodziuk et al. [21] This journal paper describes about the 3D printing developed in health care and as a modification of an old inject printer. Healthcare, automotive, aerospace and defense industries are the most vivid areas of 3D Printing applications. In medicine that are revolutionizing the way operations are carried out, disrupting prosthesis and implant markets as well as dentistry,to name but a few. 3D Printing applications in medicine are booming. X-ray or tomography images transformed into the STL format. The fewest errors are created with the CAD method.It is recognized that medical uses for 3D printing, both actual and potential, will bring revolutionary changes. Manufacturing of specialty surgical instruments, pharmaceutical research regarding drug fabrication, dosage forms, delivery, and discovery as well as manufacturing medical devices. The conclusion the paper is today the 3DP process that involves scanning, modeling and printing can take less than a day.

Rakesh Kumar et al. [22] This paper focuses on the popular name which is known the most people and themarket is 3D printing. It is an emerging manufacturing technology used to fabricate. Real life parts using CAD data by adding material in layer fashion in distinct form (solid, liquid and powder) In the automotive industry. additive manufacturing has made miracle to bring new shines. Robust designs, Lighter, stronger and safer product in the short time. The fusion of fashion and 3D printing may not sound like natural fit. But it is going to be part of everydaywears.3D printing produces part by adding material only where it needed by layer on layer a result. It produces less waste than traditional method. In aerospace industry very expensive material are used like titanium and different alloys which takes

a lot of cost, effort, and time to recycle scarp producing during machining in traditional method.J. Anderson et al. [23] The paper mainly focuses on the Endodontic applications. By the using of software Computer-aided design and computer-aided manufacturing technologies can leverage cone beam computed tomography data for production of objects used in surgical and nonsurgical endodontics and in educational settings. The endodontic literature for 3D printing is limited tocase reports and pre-clinical studies. Endodontic applications for stent-guided EMS, rapid prototyping anomalous teeth, auto transplantation and educational modelling are documented within the literature. In the future, widespread use of 3D printing technology in endodontics will be possible as further research and development occur. Research clarifying the possible utility of more affordable bench-top printers for use in individual clinics is warranted. The conclusion is given as 3D print Production time and costs are reduced. The design and manufacturing defect can be easily identified and Able to produce parts and conceptual modelsat different scales.

Jin-wu Kang et al. [24] In this paper, the past, present and future of 3D printing in the foundry sector are reviewed. The solid structure of castings and moulds will be redesigned in future into truss or spatially open and skeleton structures. There are several 3D printing methods to make a prototype, such as fused deposition modelling (FDM), lamination object manufacturing (LOM), stereolithography (SLA), selective laser sintering (SLS), Three-dimensional printing(3DP), etc. 3D printers could create models called prototypes. 3D printing of metal parts depends on metal powders and laser beam energy. 3D direct metal part making is also used to directly make automotive parts such as the gearbox and the intake manifold. The additive manufacturing technology will profoundly reshape and structures and the casting industry as the whole. The cost of the 3D printing is high and is usually counts in grams for nylon, plastic and the metal powder are counted in kilograms. It is difficult for 3D Printing to replace traditional casting production methods, but it will definitely revolutionize the casting industry.

Saeideh Kholgh Eshkalak et al. [25] The paper mainly focuses on the 3D printing techniques are being increasingly used to producemedical apparatus due to their ability to print intended designs with high dimensional accuracy. In most of the 3D printing processes, the raw material is either composed of soft plastic or metal powder. 3D bioprinting process requires a sterilized environment with a constant temperature of 37°C. Biomaterials could effectively address many health- related problems byusing new materials. Biomaterials can enable clinicians in customization of the products for individual via 3D printing.3D bio printing had developed considerably during the past decade and is progressing rapidly. Implants are one of the useful products of 3D printing in healthcare, which has been widely developed with different 3D printing techniques.3D printing technologies have been successfully utilized in medical applications and healthcare.

Reda Mohammed Zaki LING et al. [26] The paper mainly focuses on the efforts have been deployed to developing novel approaches for glass 3D- Printing. Applying the 3D-printing technology to optical glasses will enable cost-effective manufacturing of structurally complex components for a large panel of applications. High-quality functional parts are being additively manufactured in an ever-growing panel of materials ranging from polymers to metals, ceramics and metals. The amorphous nature of the 3D- printed glass network was confirmed by X-ray diffraction. Phosphate glass filaments1.90 +_0.05mm in diameter were extruded via FDM process to print various glass structures. The unwanted light scattering occurring from trapped air- filled porosities. Direct 3D- Printing of optically transparent phosphate glasses using an inexpensive FDM machine customized to allow glass filament deposition at high temperature with preserved optical and photoluminescence properties.

Varaprasada Rao et al. [27] This paper focuses on the Indian Aircraft Industry as one of the rapid growing industries in the world.3D printing was initially developed as an automated method of producing “prototypes” and “example products”. 3D printing is a process of joining materials to make objects from a 3D model data by printing them into three dimensional objects.3D printing, involves making of a three-dimensional object from a digital file or scan of the item. 3D Printing for prototypes is convincing, undoubted and preferred against old-fashioned industrial systems. The 3D printing can

introduce both a manufacturing revolution and a fundamental shift to the global economy. The promise of Additive manufacturing is the use of fewer materials, lightweight alloys and to provide small cycle time towards rapid prototyping. To produce various new methods of producing the critical parts using new materials by mixing and combining metal powders and composite materials using innovative technologies to print 3D avionic parts.

Alejandro H. Espera Jr et al. [28] This paper focuses on the printing of traces and interconnects, passive and active components such as resistors, capacitors, inductors, and application-specific electronic devices, have been a growing focus of research in the area of additive manufacturing. A circuit should at least contain one active component for it to be called "electronic". Examples of active devices are transistors, rectifiers, light-emitting diodes (LEDs) and thyristors such as silicon-controlled rectifiers (SCRs) and triode-AC. Inkjet printing is digital printing that uses a droplet depositing nozzle connected from a fluid channel and reservoir. With inkjet printing, the print head with a nozzle, allows freedom to place the print head in any location in the X–Y–Z planes of the substrate much like a CNC movement but much closer to the substrate. The conclusion of the paper is given as the 3D-printing electronics that demonstrates the meticulous processes involved, the challenges associated with these processes, the materials used, and the utilization of appropriate 3D-printing technologies.

Lorand Szabo et al. [29]This paper focuses on the permanent improvement of electrical machines. Electrical machines (EM) are an essential part of both advanced industry and the electrification of transportation. The application of diverse 3D printing techniques for advanced fabrication in this field is inevitable. The applications of Ems come up against several frequently contradictory requirements. Even small further improvements can only be made by investing an enormous amount of effort at a significant expense. Most of the AM technologies enable the easy integration of components even made of different materials, which previously had to be separately fabricated. A notable advantage of this method is that the processing costs do not depend on the component complexity. A great variety of softmagnetic materials to be used in AM of Ems is at the disposal of design engineers. The new manufacturing technology will gain more and more ground, and the performances of EMS could be considerably enhanced. New designs of EMS of a high degree of complexity and customization are also expected soon. Conventional manufacturing techniques impose design limitations that can proliferate the number of parts required to produce a component. To reduce production costs of grapheme- based thermoplastics for use in the production of high –strength plastic components.

Natalia Fijoł et al. [30] This paper will focus on the current and future monolithic water purification filters based on polylactic acid (PLA) functionalized with fish scale extracted hydroxyapatite (Hap). 3D printing offers a likelihood to develop monolithic HAp composite, with charge–specific adsorption ability, tuned pore structure, interconnected holes and easy demeanour during water conduct. Adsorption is the widely appropriate method for water treatment due to its simple procedure and capability to treat greater volumes of contaminated water. Natural resources such as cellulose and chitin, and hydroxyapatite (HAp)-based materials have been intensively used as adsorbents to remove heavy metals. The HAp was removed using a standardized workroom protocol. The conclusion of the paper was Dispersing HAp in the PLA medium was a crucial step in the processing of the 3D printable bio composite laments. Solvent assisted blending and subsequent thermally induced phase separation (TIPS) technique was used for the groundwork of spherical bits of polylactic acid (PLA) mixtures reinforced with the angle scale removed hydroxyapatite (HAp)

Jake Kidwell et al. [31] This journal paper focuses on the construction industry is constantly looking fornew ways to improve project efficiency and profitability. However, traditional building methods have remained relatively unchanged for decades. Three-Dimensional Printing(3DP) refers to an automated additive manufacturing process in which three dimensional objects are created by laying down successive layers of material. In 1981 Dr.Hideo Kadoma of the Nagoya Municipal Industrial developed a system of printing solid layers of quick-dryingphotopolymers that corresponded with a cross-sectional slice of a CAD model Although 3DP is new to construction. The technology is being utilized in many ways by contractors and architects across the world. The first and most obvious

limitation is the sheer size of the printers. The largest printer in existence is Winsun's 20' tall. By 40' wide, by 120' long concrete printer which may seem significant but is only capable of producing building components rather than fullsystems. This hinders the technology's ability to create a truly 3D printed building because there will always be the need for traditional built foundations. reinforcement, and MEPF retrofitting.

Yun Li et al. [32] This paper focuses on the key factors and innovation in the DIW processes. Polydimethylsiloxane (PDMS) hasbeen widely used in flexible electronics, biomedical tissue/organ devices and soft robots. Direct ink writing (DIW) stands out as a most inclusive technology feasible for a wide selection of materials including polymers, metals, ceramics and their and their hybrids. printing materials with different characteristics lead to different process mechanisms in the DIW process. DIW enables the construction of desirable structures from a variety of materials with complex characteristics. DIW is also more energy efficient than traditional methods of making ceramics, because the latter often need high-energy light source. The purpose of adjusting printing parameters is to achieve better accuracy, higher resolution and controlled microstructure. PDMS –based DIW offers high flexibility in structural designs and functionalities. PDMS –based DIW has demonstrated the capability to construct smart artificial structures with desirable electronic properties. DIW largely benefits fromthe ingenious design of ink printability and the future development of DIW is closely related to ink design.

Ruby J chase et al. [33] This journal paper is focused on the criminal justice purposes. Crime scene investigators and forensic examiners haveused it in accident reconstruction, replication of crime scene evidence, and facial reconstruction from unidentified skeletal remains. 3D Printers can create a variety of highly customizable objects at relatively low cost. justice practitioners can use the technology to print replicas of evidence and crime scenes. Small items of evidence can also be printed at a large scale to show detail. The law enforcement community is concerned about people printing metal objects such as explosive devices, weapons, or other parts for illicit purposes. 3D Printing is a tool forcriminals, who can use the technology to print guns and other weapons and objects for host of despicable activities. A completed FDM object does not require post treatment unless the hobbyist uses support physical in the printing. There is a great potential to recover latent prints and DNA from 3D printers and printed objects.3D printing may alsooffer a way to successfully by pass a number of biometric security measures.

Mohammad Suhel Karkun et al. [34] This paper focuses on the printing of3D objects .3D printing technology has founded industrial applications in the automotive and aerospace industries for printing prototypes of car and aero plane parts. The applications of 3D printing in private and management defence have been rapidly predictable.3D Printing has been limited to biomedical applications and engineering, although it shows tremendous potential in the chemical sciences. The 3d printer interprets the digitally supplied coordinates derived from the STL file by converting the file into a file. In the medical field several other methods are utilized to generate 3D object rendering. As a power-based 3D printing technique, inkjet printing does not require photopolymerizable materials or liquids with modified viscosities. The conclusion of the paper is notable advantage of FDM is it can create objects fabricated from multiple types by printing and subsequently changing the print material.

Bethany C. et al. [35] This paper focuses on the conception of 3D printing, also referred to as additive manufacturing (AM), rapid prototyping (RP), or solid-freeform technology (SFF), was developed by Charles Hull. Two photon polymerizations have also been used in SLA fabrication to reach higher resolutions of final printed objects. One advantage of SLS is that a wide range of materials can be used, from polymers such as polycarbonate (PC), polyvinyl chloride (PVC), acrylonitrile butadiene styrene (ABS), nylon, resin, and polyester to metal and ceramic powders. 3D printing allows for the printing of cells and hydrogels, which are hydrated polymers that provide a biodegradable structure onto which cells can adhere and grow. The liver has proven difficult to recreate on a 3D platform due to its complex structure. There are a number of rapid prototyping techniques that lend themselves to the fabrication of bioartificial livers and other medical appliances.

A. plotkowski et al. [36] This paper focuses on the additive manufacturing of functional alloys has become a promising area of research for the development of novel devices. The AM cores showed performance roughly comparable or better than theconventional non-oriented sheet. But higher power losses than Goss concerned with sheet power losses may be generally decomposed into hysteresis losses, related to intrinsic material properties grain size, and crystallographic texture, while eddy current losses, which result from induced electrical currents, are related to electrical resistivity and device geometry. Samples were sectioned from approximately the center of various components with respect to build height and were prepared for characterization using standard metallographic techniques. The better eddy current response of the high-si steel is increasing si content. The grain boundaries in the annealed case exhibited a wavy or corrugated shape characteristic of grain boundary pinning from secondary phase particles.
Amit Bandyopadhyay et al. [37] This paper describes the Three-dimensional (3D) printing represents the direct fabrication of parts layer-by-layer, guided by digital information from a computer-aided design fi le without any part-specific tooling. surgical transplants are currently manmade by making a near-net-shape part via forging, casting, or machining operations, followed by specialized surface finishing or treatments for the desired surface, mechanical properties, and aesthetic effects. Unlike CM processes such as forging or investment casting, many 3D printing processes are different in terms of the materials that can be used and the delivery of materials. For example, a polymer-based 3D printing process will not work for metals or ceramics and vice versa. An analysis of several leading reviews as well as industry reports suggest that the so-called "MedTech segment" could be one of the greatest benefit carries of the submission of AM technology.
Yu Ying Clarrisa Choong et al. [38] This paper describes the 3D-printing factories has great potential. 3D printing1 has redeployed its capabilities in the crucible of COVID-19 answers, illustrative its modest advantage in this substitute situation. 3D printing is also being used to provide training and conception aids for healthcare workers to cope with the limited pool of trained personnel. 3D printing has stepped up to become a vital knowledge to support improved health care and our general answer to the spare. The crisis has highlighted how 3D printing can be at the base of an olive green and additional ecologically friendly future. There are increasing concerns around the potential risks associated with the medical use of 3D-printed devices during this epidemic. Finally, 3D production has been used to construct provisional emergency houses to isolate those under isolation, dismissing the laden medical infrastructures. Linked to traditional construction methods, 3D printing of buildings usually requires shorter building aeras and lower labour costs, and can use more environmentally friendly raw resources. finally, the conclusion of this paper is which the 3D printing plays a major role in the future for the health requests and other emergency cases.
CH. Venu Madhav et al. [39] This paper describes about Rapid Prototyping technologies allow easy scaling down (or up) of the size of a model by scaling the original case. In a case of designs with different holding capacities, the designer can simply scale the CAD model appropriately for the desired capacities and view the versions on the CAD software. Hard tooling produced by rapid prototyping systems has been a major topic for research in recent years. The advantages of hard tooling produced by rapid prototyping methods are fast turnaround times to create highly complex-shaped mold tooling for high volume production. The fast response to modifications in generic designs can be almost immediate. Sundstrand assembled the various parts and examined them for form, fit, limit function, permissions and interventions between the housing and the many Sub-assemblies were checked. The conclusion of the paper was as shown in with after the initial inspection, several problematic areas were found and were corrected and incorporated into the CAD Design in some cases new models were made.
Mohd Javaid et al. [40] This journal paper designates around the claims of 3D printing for healthcare study and progress and this technology was low-cost and to function further efficiently with customized equipment and representations. The paper discovers the character of 3D printing also 3D bioprinting in healthcare. The 3D printing which uses in the hospitals and other organizations for the

multiple purposes and Doctors can cut time in the functioning room by prepping for process with a 3D-printed classical, thereby scarcer problems and an improved long-term forecast for the patient should make use of these additive manufacturing technologies. 3D printing knowledge to help invention in virtually every profitable part, from medical replicas and model mechanisms to 3D printed assistance equipment called prosthetics and wheelchairs. These gadgets, made of biocompatible polymers and metallic element, can be single-use or recyclable. By using the 3D printing the scientist made a cardiac heart tissue in lab conditions that match the physical assets of the contributor enduring, which is a dangerous step toward making a fully 3D-printed human heart and used in the skin cell tissues making. The conclusion of the paper is the ability to customize medical items and equipment. surgical directors customized for each enduring can recover accurateness while convertible time in the working room. High-quality functional replicas are expensive, and level the optimum have a limited number of substitutions.

III. Conclusion

The world is forever changing with the help of 3D printing. The use of 3D printing for medicinal purposes today is beyond astonishing but what the future holds is unknown, however It is certain that additive layer manufacturing will be a large corporate in solving our problems. 3D printing really is limitless and only the surface has been scratched, there is still much more to be uncovered. As shown in throughout the web page. 3D printing bones is still new and continuously improving and adjusting but it has already enhanced the life of many patients around the world and more specifically in Australia. It is evident that the more funding and research put into 3D printing, the further 3D printing will take us. 3D is forever unpredictable. “If a picture is worth a thousand words… A prototype is worth a thousand pictures.” 3D printing technology is a major on the original manufacturing technology, which is slowly changes our production and life, but also plays an extremely important role in cultural creative design, industry, biological and medical fields.

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