FABRICATION AND ANALYSIS OF POLYMER BOLT AND NUT ASSEMBLY BY ADDITIVE MANUFACTURING SYSTEM

S.Boopathy[1] TTM.Kannan[2] R.Elangovan [3]

[1] Department of Mechanical Engineering, PRIST to be University, Thanjavur-613403, India.
[2] Associate Professor, Department of Mechanical Engineering, PRIST to be University, Thanjavur-613403, India
[3]Professor, Department of Mechanical Engineering, Mookambigai College of Engineering, Pudukkottai-622502, India

Abstract: The new innovation named added substance fabricating (Additive Manufacturing) is picking up centrality in the mechanical part because of its ability to characterize new upgrades in the plan, creation and strategic issues identified with a particular item. This new zone in modern designing is getting to be usable yet is as yet not effectively pertinent to a wide range of creation frameworks. Added substance fabricating (AM), otherwise called quick prototyping or 3D printing, and for the most part alludes to procedures that produce three-dimensional parts by including material bit by bit in a layer by layer design. This unique issue plans to assemble research and advancements in AM, especially identified with new assembling procedures and additionally to elective feedstock materials and items. Polymer and metal-based crude materials and items have been widely researched in AM systems. In this trial work, Conventional screw, nut and washer are delivered by 3 D printer utilizing programming. The fastener nut and Washer is structured by professional E programming and manufactured by 3 Printer. At long last strength of polymer screw and nut gathering was resolved and contrast and steel made fastener and nut get together

Keywords: Additive manufacturing, 3D printing, Fasteners, Modeling, Fabrication, Hardness test

1-Introduction: Additive Manufacturing (AM) develops segments layer by layer utilizing materials which are accessible in fine powder structure. Added substance fabricating (AM), otherwise called fast prototyping or 3D printing, for the most part alludes to strategies that produce three-dimensional parts by including material progressively in a layer by layer design. In this sense, AM varies in a general sense from framing and subtractive techniques. Polymer and metal-based crude materials and items have been broadly explored in AM strategies. The essential advances associated with the procedure are as underneath. 1. Make a CAD model of the plan 2. Convert the CAD model to STL design 3. Cut the STL document into slight cross-sectional layers 4.Develop the model one layer on another 5.Clean and completion the model. The term "quick prototyping" is utilized in different ventures to portray the procedure of fast advancement of an agent framework or item before its last usage and commercialization. With regards to item advancement, this term incorporates present day innovations that are utilized to make physical models straightforwardly from computerized information. The fundamental standard on which is based this innovation is to initially create the model which ought to be made in CAD programming for 3D displaying and after that a similar model produce the suitable gadget without the requirement for itemized arranging of mechanical procedures and generation. Thusly is essentially improved the way toward making complex 3D protests legitimately from CAD documents. Added substance producing innovation has two key dimensions of utilization fast prototyping and quick assembling. Fast prototyping implies, for example, the term alludes to that, making different models, test models, tests, models, and so on while quick assembling methods creating completed items, hardware, devices, segments or parts that following

the innovative procedure discover its usage by and by.3D printing procedure depends on inkjet spouts which apply fluid cement supply to a powdered polymer material. After change into STL design CAD model ought to be cut, utilizing the fitting PC program, to several advanced cross segments. Printing procedure starts by warming the chamber and applying the layer of the polymer powder

II-LITERATURE SURVEY

1. Sebastian Hällgrena,b*, Lars Pejrydb, Jens Ekengrenb, 2016, (Re)Design for Additive Manufacturing, Procedia , 50, PP 246 – 251. How to design for additive manufacturing classified into two method primary process-driven shape and secondary designer-driven shape. Primary method analysis-driven, iterative process creates value by increasing performance. Secondary method by lattices in domain manufacturing may also reduce volume and printing time and printing cost. However, lattices are very hard to analysis for performances due to its geometry complexity and distorted triangle of AM domain.

2. Myriam Orquéra*, Sébastien Campocasso, Dominique Millet, 2017, Design for additive manufacturing method for a mechanical system downsizing, Procedia, 60, PP 223 – 228. The main contribution this paper demonstrate that with the multifunctional optimization method defines about the redesign of mechanical system in case design failure. This tool takes full advantages of AM process to improve function but not easy to implement in additive manufacturing. The functional improve rate in order to compare the different solution with old and new design. Tests must be made to complete the featured data.

3. Jan-Peer Rudolpha,*, Claus Emmelmanna,b, 2017, Analysis of Design Guidelines for Automated Order Acceptance in Additive 3.Manufacturing, Procedia, 60, PP187 – 192. This

III-Experimental details

The polymer fastener and Nut get together is manufactured by Fused Deposition Method in 3D printer procedures. There are 3 stages are engaged

thickness 3.18 mm on which the model ought to be made and after the finish effectively expelled. This implies the readiness for the printing procedure. Next, slider apply along the chamber another layer of polymer powder thickness 0,1 mm. From that point onward, inkjet print head go through the chamber and apply glue supply and shading.

paper presents different algorithmic approaches for an automated checking of manufacturing restrictions and design guidelines for AM. The algorithm of the surrounding sphere is used to check part size and the approach of the subdivided space should be used to check the design guidelines (wall thickness, gap dimensions). For future research is an accurate estimation of the build orientation and its integration to check the design.

4. Mellor, S; Hao, L; Zhang, D, 2016, Additive manufacturing: A framework for implementation, http://hdl.handle.net/10871/22191. The scenario investigated in this Paper is that of a company coming from a background in prototyping and implementing AM as a new manufacturing process for production of new products. New design for additive manufacture constraints and changing a conventional production culture would likely have greater influence on implementation success.

5. Subodh kumar, Chouthary A K S, Anand Kishore, Amit Kumar Gupta, 2016, A comparison of additive Manufacturing Technology,International journal for Innovative Reasearch in science and technology, 3, PP 2349-6010. Additive manufacturing is an enabling technology for concurrent engineering. The mail goal is to reduce the manufacturing time and easy to make complexity component and reduce manufacturing cost. Some of the parameters such as surface finish, eliminating secondary finishing operation problems have overcome to be succeeded completely.

with Fabrication of designing parts, for example, Modeling, Stereo lithographic and printing (fig1.2&3).

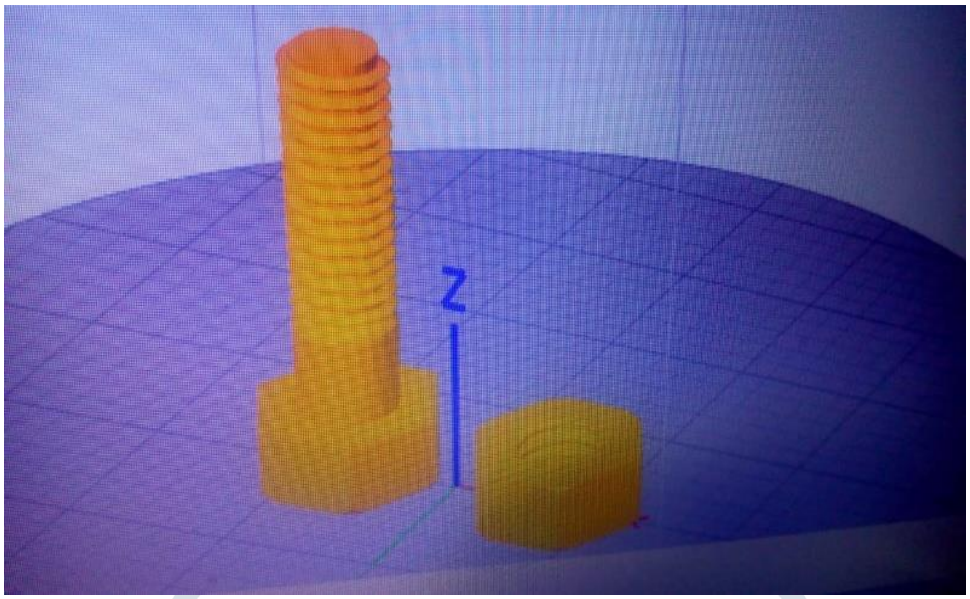

Fig 1 Modeling of M16 Polymer bolt and nut assembly

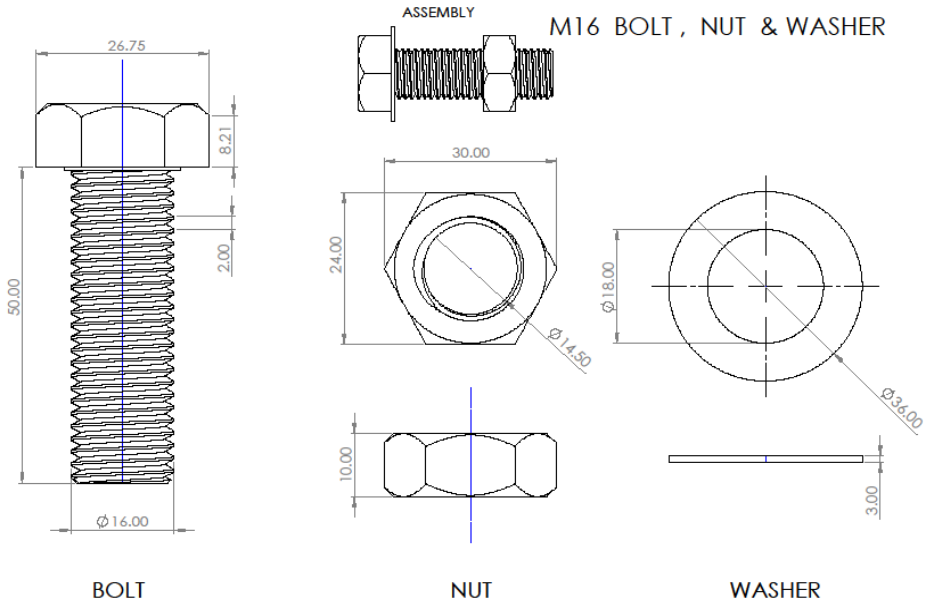

Fig 2 Polymer M16 bolt and nut assemble drawing

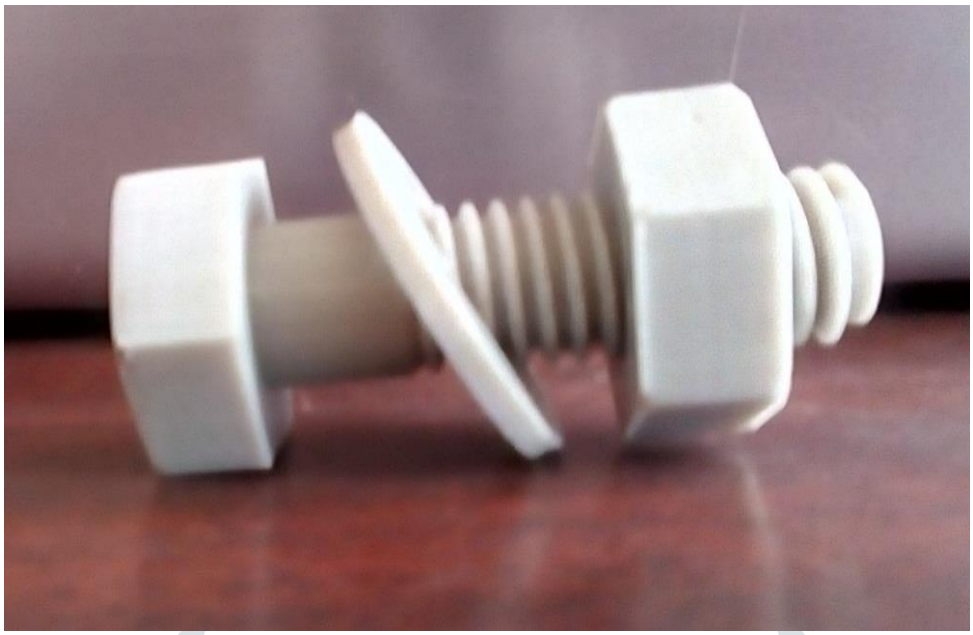

Fig 3 Polymer bolt and nut assembly

IV-Result and discussion

Polymer bolt and nut assembly is analyzed by ANSYS R-15 software (fig 4). The various engineering analysis such as stress, strain and stiffness are found.

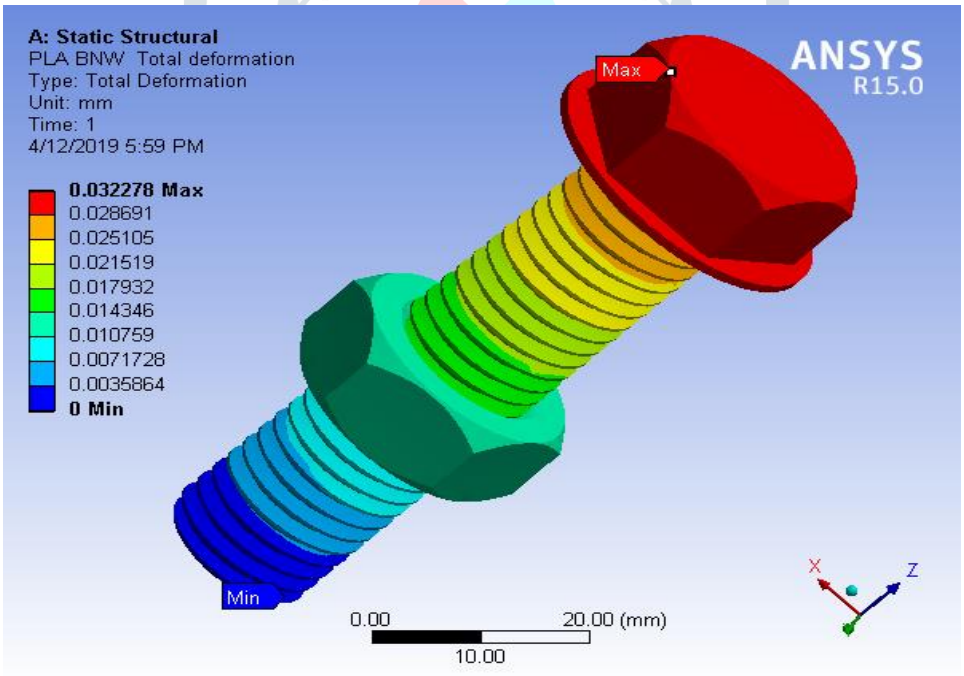

Fig 4 Finite element analysis of Bolt and nut assembly

The polymer bolt and nut assembly is printed by 3D printer using fused deposition method and hardness is measured by using Polymer hardness tester. The corresponding values are tabulated in Table 1

Fig 5 Hardness measurement of bolt and nut assembly

Table 1 Hardness Value of Polymer Bolt, Nut and Washer

Sl .No	Part name	Material	Hardness Vale
1	Bolt	PLA	87
2	Nut	PLA	87
3	Washer	PLA	91

The polymer made (PLA) bolt and nut assembly hardness is measured by polymer Hardness tester (fig 5) and values are compared with steel made Bolt and nut assembly

V Conclusion:

Polymer based mechanical elements Bolt and Nut assembly has been fabricated successfully using 3D printer, it concludes that

1. Bolt and Nut with Washer is fabricated by PLA material in actual size of M16 without any defect.
2. Various Engineering value of stress young's modulus of rigidity stiffness of PLA Made Bolt and Nut with Washer is calculated by ansys software and values are compared with design of machine element.
3. The polymer made Bolt and Nut with Washer is tested by salt water bath and corrosive calculated by weight loss method. But these in no weight loss in polymer bolt results (polymer bolt is suitable for marine and corrosive environment applications).
4. The polymer Bolt and Nut with Washer also analyzed by both static and dynamic form of environment.
5. The polymer bolt nut assembly is recommended to implement in the Mechanical application in the place of steel.

VI References

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